The Electrical Industry's Weekly Magazine

August 6, 1956

Electrical World

Price 35 Cents

A McGraw-Hill Publication

How Distribution Design Cuts Tree Trouble

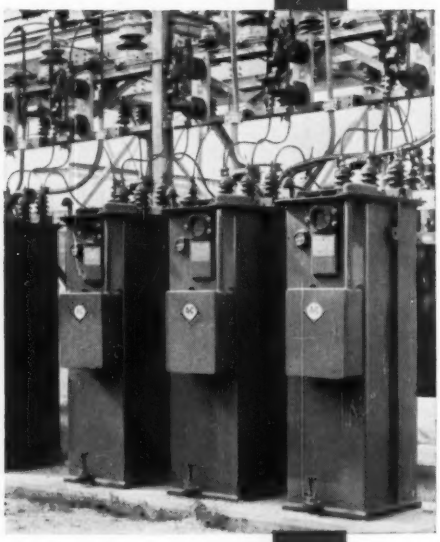
...Page 73

How Presidential Candidates Stand on Power ...Page 64

Fast Delivery from

Nationwide Field Stocks

keeps regulators operating at their best



Here's what happened when a northern utility called an Allis-Chalmers office for regulator parts. Thanks to Allis-Chalmers nationwide stocking program, the parts were on hand. Next morning these parts were at the utility location and the regulator back on the line.

That's everyday service from Allis-Chalmers. A-C people understand your need for continuous operation and they cooperate in helping you get it. Field stocks and field service are designed to help you get the most profit from your regulator operation.

Next time you consider a voltage regulator purchase, consider that you're buying regulation, not just a regulator. You'll go Allis-Chalmers all the way — because Allis-Chalmers field regulator service goes all the way to meet your needs.

Find out for yourself. Ask about A-C regulator service. Call an Allis-Chalmers office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-4842

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Fischer Black, Publisher and Editor
Jesse Mock.....Asst to the Editor

Daniel T Braymer.....Managing Editor
Leonard M Olmsted.....Associate Editor
Kenneth K Kost.....Associate Editor
Herbert R Frankel.....Associate Editor
Rue M Shoop.....Associate Editor
George Swift.....Associate Editor
Edward Allen.....Midwestern Editor
H S Knowlton.....New England Editor
John J Kearney....Middle Eastern Editor
Francis Kovalcik.....Western Editor
Allen Long.....Northeastern Editor
David Rea.....Southeastern Editor
E Bryson Sessions.....Commercial Editor
Arthur J Stegeman.....Assistant Editor
James G Plunkett.....Assistant Editor
Denise Hennessy.....Editorial Assistant
Theodore W Fuller.....Editorial Assistant
Ary Mossiman.....Mgr, Market Research
Frank C Stockman.....Art Director
H T Howland, Jr.....Production Editor
G B Bryant, Jr..Mgr, Washington Bureau
V C Richter....Washington Correspondent
Dexter M Keezer.....Dir, Economics Dept
E Benoit-Smullyan.....Economist
A E Knowlton.....Consulting Editor

Domestic News Service: Atlanta, Chicago, Cleveland, Detroit, Houston, San Francisco.

World News Bureau: John Wilhelm, Editor; Bombay, Bonn, London, Mexico City, Paris, Rio de Janeiro, Tokyo.

Warren W Shew.....Sales Manager

District Managers: N V Palmer and E S Chapin, New York; E S Chapin, Boston; F P Coyle, Philadelphia; M S Kearney, Cleveland; M I O'Connell, Detroit; W H Meneilley and J T Schaefer, Chicago; J T Schaefer, St. Louis; E E Schirmer, Los Angeles; R C Alcorn and T H Carmody, San Francisco; William Lanier, Atlanta; Douglas Billiam, Dallas.

Otto Drechsel.....Business Manager

ELECTRICAL WORLD

Published weekly by McGraw-Hill Publishing Co., Inc., Executive, Editorial and Advertising Offices: **McGraw-Hill Building, 330 West 42nd Street, New York 36, N. Y.** Publication Office, 99-129 North Broadway, Albany 1, N. Y.

Donald C. McGraw, President; Paul Montgomery, Executive Vice-President; Joseph A. Gerardi, Executive Vice President and Treasurer; John J. Cooke, Secretary; Nelson Bond, Executive Vice President, Publications Division; Ralph B. Smith, Vice President and Editorial Director; Joseph H. Allen, Vice President and Director of Advertising Sales; J. E. Blackburn, Jr., Vice President and Circulation Director.

Subscriptions: Address correspondence to Electrical World—Subscription Service, 99-129 North Broadway, Albany 1, N. Y. or 330 W. 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are solicited only from executive, supervisory, and engineering personnel in electric utilities, manufacturing companies, and related fields. Position and company connection must be indicated on subscription orders.

Single copies 35¢. For the United States and possessions and Canada, $6 a year, $9 for two years, $12 for three years. Other Western Hemisphere, and the Philippines, $15 for one year, $25 for two years, $36 for three years. All other countries, $25 for one year, $40 for two years, $50 for three years. Entered as second-class matter at the Post Office at Albany, N. Y. Printed in USA. Copyright 1956 by McGraw-Hill Publishing Company, Inc. Permission required to reproduce any of contents.

Electrical World

Published for 82 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

Vol. 146, No. 6 **August 6, 1956**

ELECTRICAL WORLD'S INDUSTRY REPORT

DISTRIBUTION DESIGN CUTS TREE TROUBLE 73

MANAGEMENT

Electrical Business Outlook ... 19
Statistics 20
Your Business 21
Finance and Regulation 170

SUBSTATIONS

NEW ASA POWER TRANSFORMER STANDARD 69
TEST WEEDS OUT BAD INSULATORS 93
CAPACITORS ON POLE CONSERVE SUBSTATIONS SPACE 117

GENERATION

SIMPLE CHANGES ELIMINATE TEMPERATURE ERRORS 99

DISTRIBUTION

LOW COST REEL SAVES TIME ON SMALL JOBS 102
TRUCK EASES TREE TRIMMING OPERATIONS 102

MAINTENANCE

VEHICLES, ENGINES STORED SAFELY 108

ENGINEERING REFERENCE SHEET 98

INDUSTRIAL APPLICATIONS 118

HEATING AND COOLING ELECTRICALLY 124

SALES AND SERVICE 126

INDUSTRY NEWS

Electrical Week 62
Current Events 64, 162
Manufacturing and Markets ... 154
News About People 158
Meetings Calendar 166

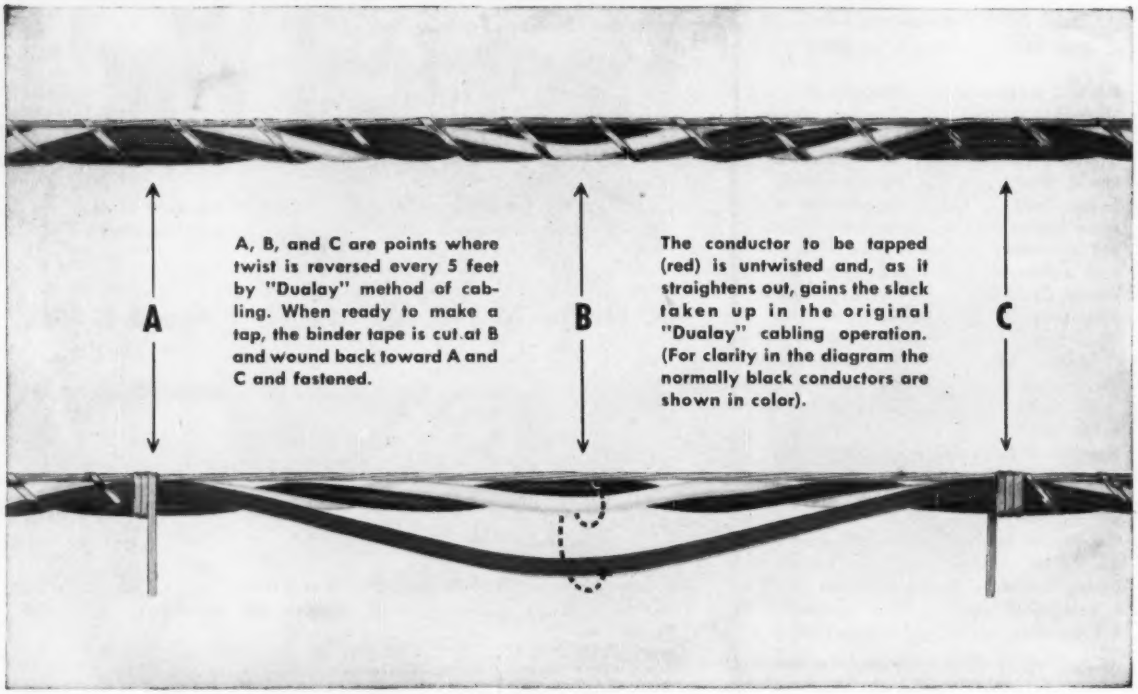
EQUIPMENT NEWS

New Equipment 128
Catalogs and Bulletins 150
Industry Films 153

EDITORIAL AND COMMENTARY

Technical Notes 22
Editorial 61
Washington Comment 22

INDEX OF ADVERTISERS 175


A
A, B, and C are points where twist is reversed every 5 feet by "Dualay" method of cabling. When ready to make a tap, the binder tape is cut at B and wound back toward A and C and fastened.
B
The conductor to be tapped (red) is untwisted and, as it straightens out, gains the slack taken up in the original "Dualay" cabling operation. (For clarity in the diagram the normally black conductors are shown in color).
C

how DUALAY* further reduces cost of self-supporting aerial cable

Most public utilities are fully aware of the economies of self-supporting aerial cable distribution systems. Savings are realized through ease of installation, reduction in tree trimming, fewer service interruptions, use of longer spans, and lower maintenance costs.

However, the DUALAY* assembly, originally developed by Okonite engineers and now a standard construction on all 3/c Okonite self-supporting cables up to 15kv, offers still further installation and maintenance economies.

Main feature of the Dualay assembly is that the direction of lay of conductors is reversed at regular short intervals. This permits unshielded cables to be tapped hot. (See diagram above.) The phases can be separated without cutting the copper or aluminum conductors and without performing any operation on the messenger. Design permits use of wire guards and rubber blankets for safety, and lineman can open up cable for tapping at a pole without use of a platform. Dualay assembly also prevents longitudinal or tension stress on the conductors and assures strain-free conductor splices.

For a full discussion of cost and operational advantages of Okolite-Okoprene aerial cable with Dualay Assembly, write for Bulletin EW-1074A, to The Okonite Company, Passaic, N. J.

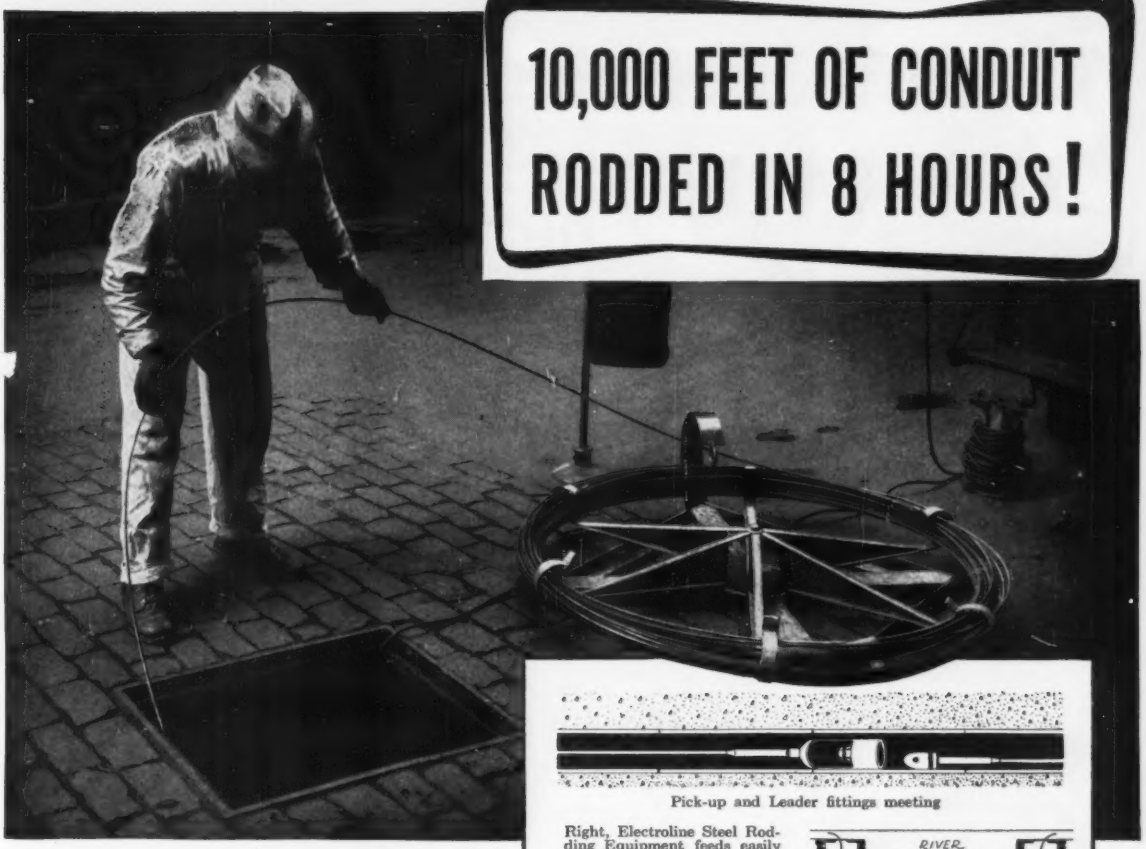
available with either copper or aluminum conductors

where there's electrical power . . . there's **OKONITE CABLE**

*U. S. Pat. No. 2,430,378

4347

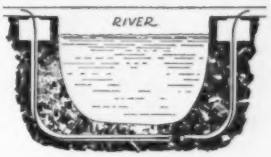
10,000 FEET OF CONDUIT RODDED IN 8 HOURS!



Pick-up and Leader fittings meeting

Right, Electroline Steel Rodding Equipment feeds easily around the bends.

Below, Leader locked in Pick-up for either push or pull.



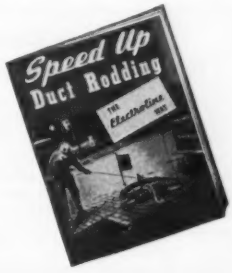
EASY DOES IT!—It's all in a day's work with Electroline Steel Duct-Rodding Equipment rodding 10,000 feet of conduit!

Light in weight, easily handled and stored, low upkeep: these are a few of the advantages utility men know to be true. But even bigger, more important advantages are—

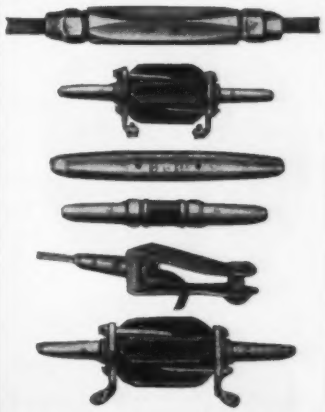
- *Savings in the cost of labor*—for example, where it formerly took two gangs from one to two weeks on a given job, one gang, *in one-half hour*, has completed the same job—using Electroline Duct-Rodding Equipment.
- *Savings in original cost*—you get long life—double that of other types—when you buy Electroline Duct-Rodding Equipment. Add to that this fact: this equipment costs just about half as much for equivalent capacity! *There's true economy.*
- *Savings in Total Investment*—fewer sets are required because of the speed with which a job is completed and the equipment moved to other locations.

Speed up installation, reduce your costs; start now to use Electroline Duct-Rodding Equipment. Available for 3", 3½" or 4" Duct.

We've got a 4-page brochure which describes and illustrates more completely how this equipment can benefit you. We'll gladly send you a copy. Write us.

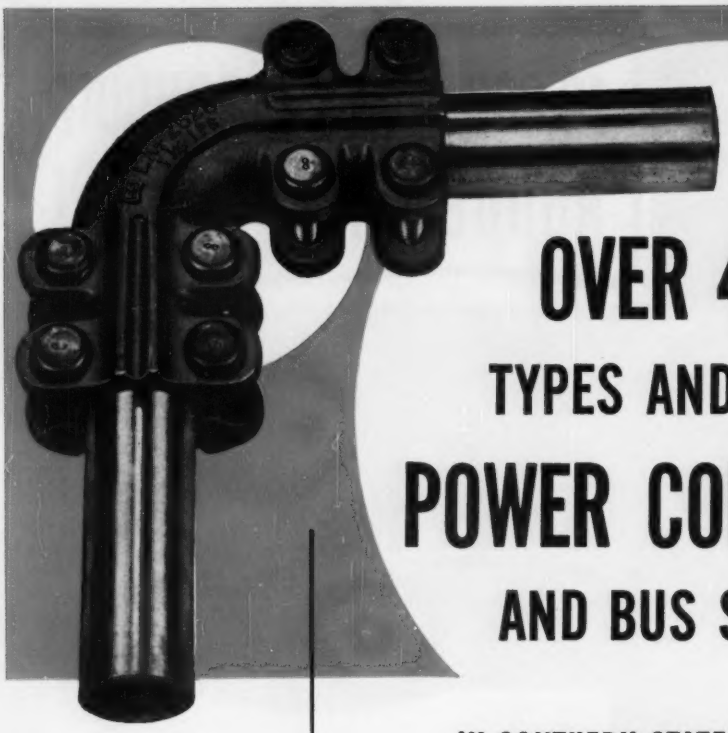


OTHER *Electroline* PRODUCTS

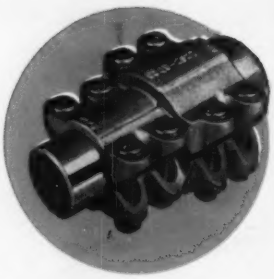


Electroline Company

4121 South La Salle St., Chicago 9, Ill.
In Canada: POWERLITE DEVICES, LTD., TORONTO



OVER 4,000
TYPES AND SIZES OF
POWER CONNECTORS
AND BUS SUPPORTS



IN SOUTHERN STATES' COMPLETE LINE

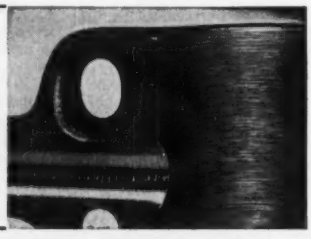
To meet the widest range of requirements for power and grounding connectors, Southern States produces more than 4,000 different types and sizes—many on special order to customers' specifications.

Widespread use of self-supporting, rigid, tubular bus constructions in substations has increased the mechanical requirements of many connectors. That is why Southern States connectors have been re-designed during the past two years. They now have stronger ears and are 40 to 50% heavier.

When you specify and use Southern States connectors, you can be sure they are capable of: 1) serving as self-supporting members; 2) providing good electrical connection; 3) developing full strength of clamping bolts without visible distortion; 4) carrying current equal to the conductor without excessive temperature rise; 5) being installed with a minimum of effort and time.

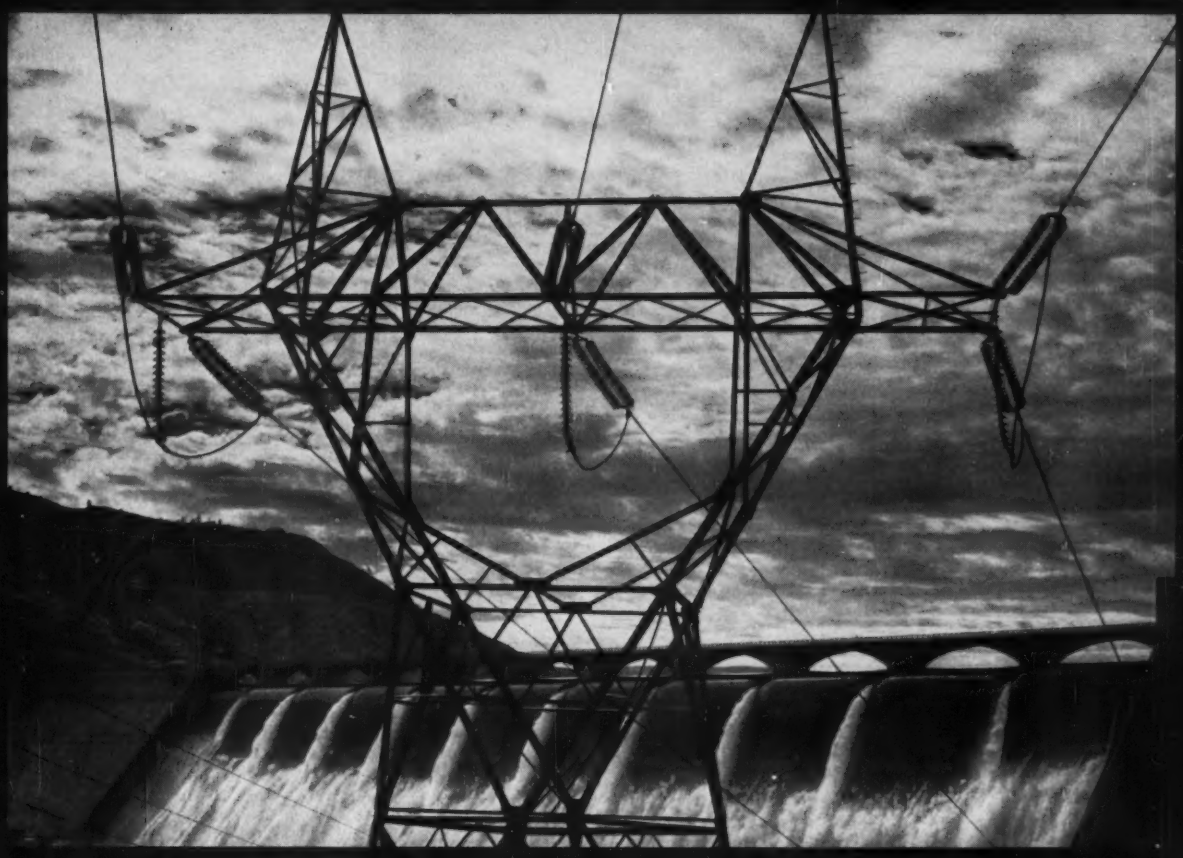
Rough Ground for Best Possible Contact

Every Southern States connector is rough ground on all contact surfaces. This permits the connector to bite into the conductor, causing intimate metal to metal engagement at thousands of high-pressure contact points, thus providing a better junction and one that is sealed against corroding atmosphere.



SOUTHERN STATES EQUIPMENT CORP.
HAMPTON, GEORGIA

IN CANADA: Dominion Cutout Co., Ltd., Toronto



Cable insulation that can't take it . . . is water over the dam!

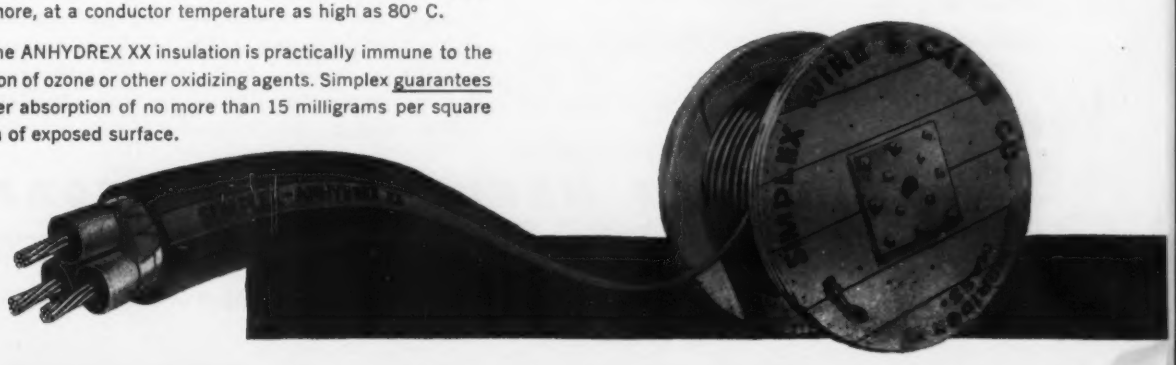
Losing power through weak cable insulation is fast becoming a thing of the past. For, more and more, today's trend is toward Simplex-ANHYDREX XX insulated cables — which withstand the toughest punishment in any location.

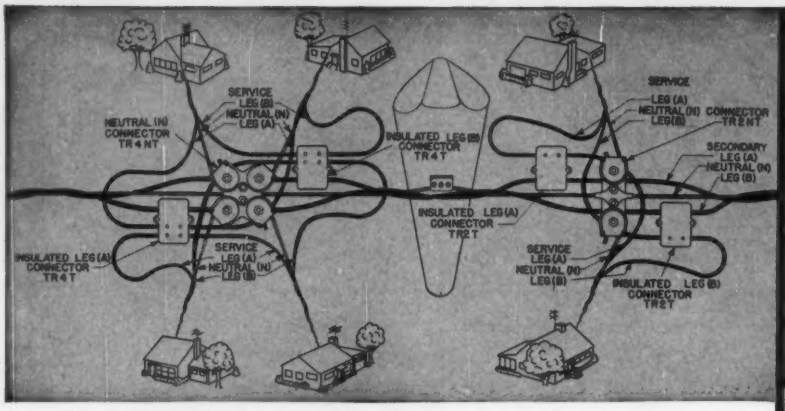
Simplex-ANHYDREX XX insulated cables are designed and built to operate under conditions that would destroy any other insulation. They operate at voltages of 2,000 to 25,000 or more, at a conductor temperature as high as 80° C.

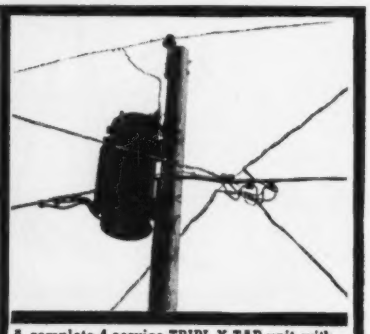
The ANHYDREX XX insulation is practically immune to the action of ozone or other oxidizing agents. Simplex guarantees water absorption of no more than 15 milligrams per square inch of exposed surface.

Features like these are making Simplex-ANHYDREX XX cable first choice for all power transmission lines — no matter where the location or what the conditions.

Be sure to specify Simplex-ANHYDREX XX for your high voltage applications. For more information, write for booklet 1009. **SIMPLEX WIRE & CABLE CO.,** 79 Sidney Street, Cambridge 39, Mass.




SERVICE LEG (B) NEUTRAL (N) LEG (A)
NEUTRAL (N) CONNECTOR TR4NT
INSULATED LEG (B) CONNECTOR TR4T
SERVICE LEG (A) NEUTRAL (N) LEG (B)
INSULATED LEG (A) CONNECTOR TR4T
SERVICE LEG (A) NEUTRAL (N) LEG (B)
INSULATED LEG (A) CONNECTOR TR2T
SERVICE LEG (A) NEUTRAL (N) LEG (B)
INSULATED LEG (B) CONNECTOR TR2T
SECONDARY LEG (A) NEUTRAL (N) LEG (B)



A complete 4 service TRIPL-X-TAP unit with type GTC connectors used as secondary feeder taps. †

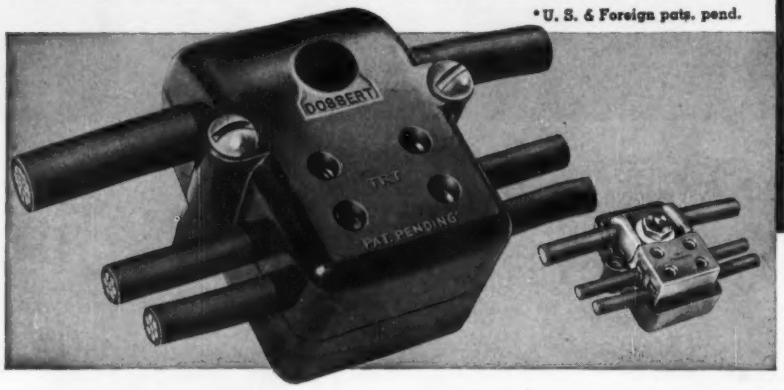
Dossert leads the industry again with the NEW

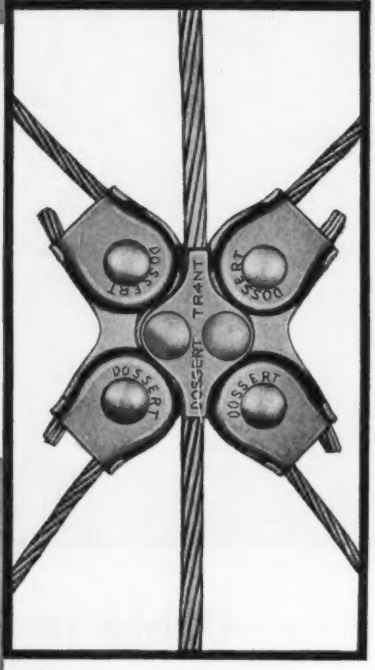
TRIPL-X-TAP*

3-UNIT CONNECTOR

FOR SELF-SUPPORTING SECONDARY AND SERVICE DROP CABLE

*U. S. & Foreign pats. pend.





NEUTRAL CONNECTOR

INSULATED CONNECTOR

Forget about hand-taping . . . about complicated residential hook-ups!

Dossert's new TRIPL-X-TAP 3-Unit Connector—for conductors of copper or aluminum or both—saves labor and installation costs . . . insures the most dependable connections possible.

TRIPL-X-TAP or its components can also be used on open wire systems.

Two Insulated Connectors plus a Neutral Connector comprise the compact, low cost TRIPL-X-TAP "package". No need to remove insulating cover for subsequent connects or disconnects. No secondary spool racks or costly extra hardware. TRIPL-X-TAP installations insure positive electrical joints and through use of supporting neutrals guarantee mechanical permanence. The insulated connector housing is made of high strength, high impact Bakelite composition, affording better insulation and protection.

† Courtesy of Long Island Lighting Co.

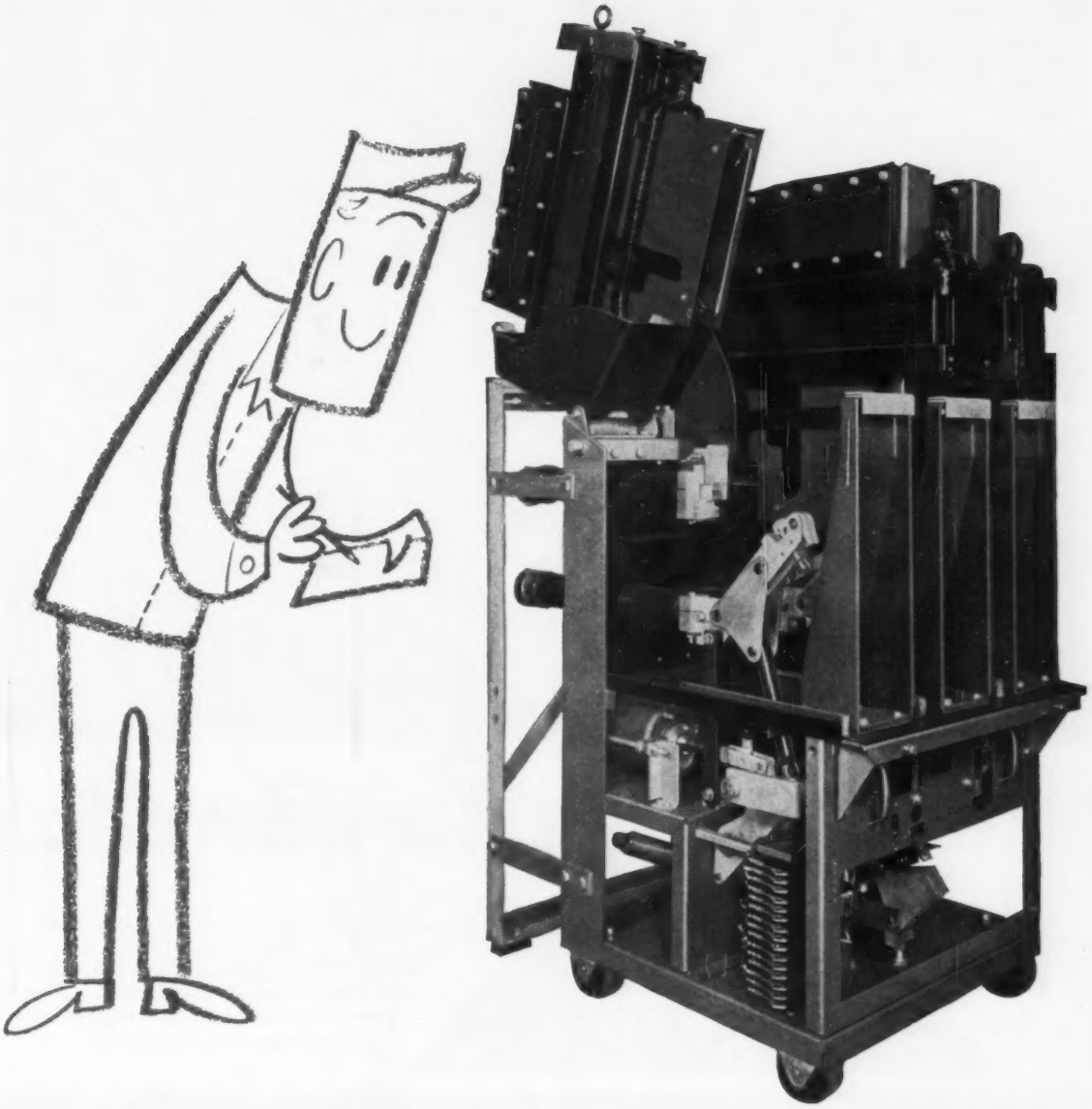
50 YEARS OF TECHNICAL KNOW-HOW

Write for details and prices today.

DOSSERT MANUFACTURING CORP.

249 Huron Street, Brooklyn 22, N. Y.

Exclusive Canadian Distributor: W. S. Gerrie & Assoc., Ltd.
4158 Dundas St., West Toronto 18, Ont., Canada



SEE VALUE HERE YOU'LL SEE NOWHERE ELSE

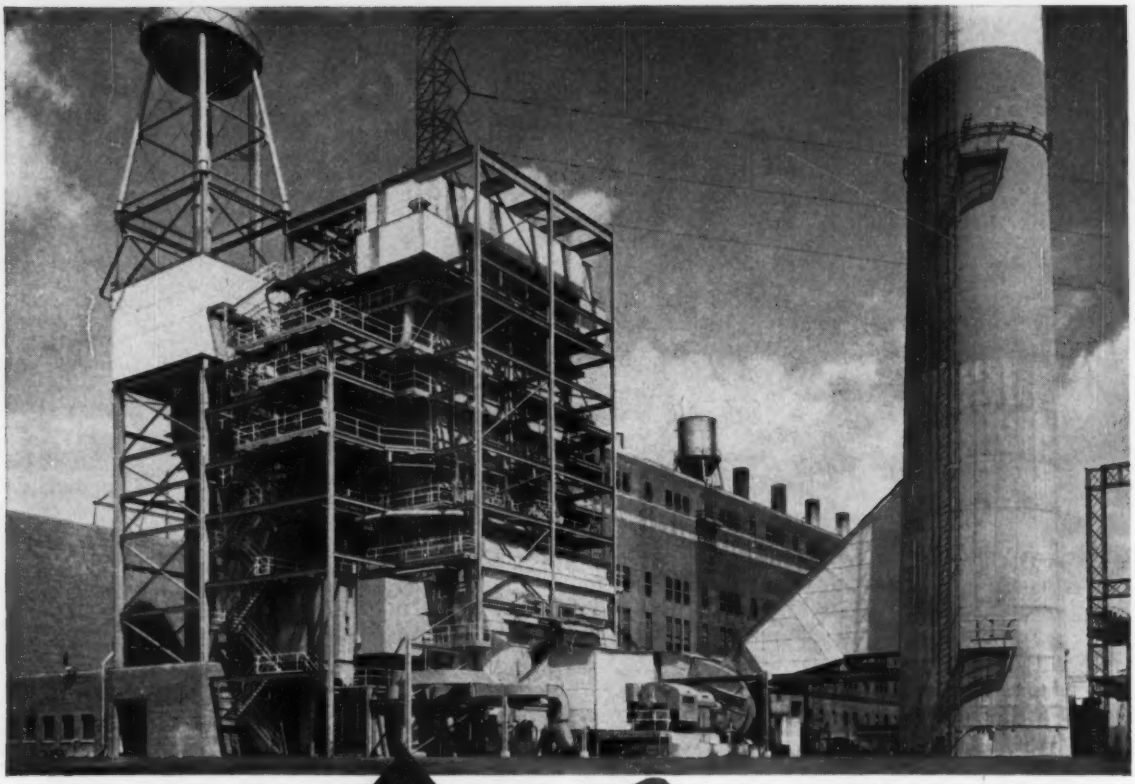
Operating engineers in the electrical industry often say you can see the higher quality in I-T-E switchgear even when you stand 'way back.

Of course, they're only partly right. You can easily see the practical component arrangement, the all-welded steel construction with compartments designed to retain shape even when lifted as a unit, and the clean, neat appearance. These are standard on all I-T-E switchgear.

But we want you to look closer—see even more. For example, in Metal-Clad Switchgear: the easy-to-service horizontal drawout design; the tilting arc chutes; the extra-heavy insulation. There's quality in every detail—quality that means dollars' more value for your switchgear investment and years' longer troublefree service.

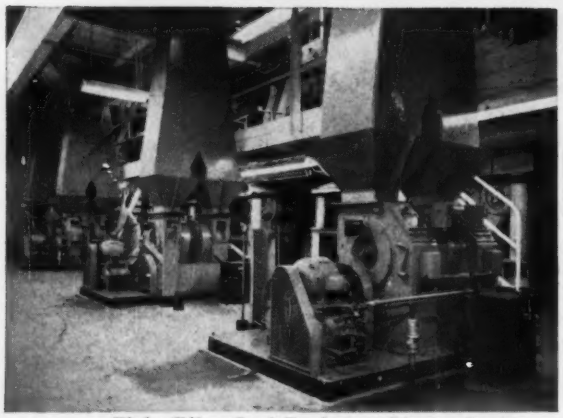
Why not phone the I-T-E office nearest you. Or write for bulletin 7004 giving a complete description of 5, 7.5 and 15 kv switchgear. I-T-E Circuit Breaker Co., 19th & Hamilton Sts., Phila. 30, Pa.

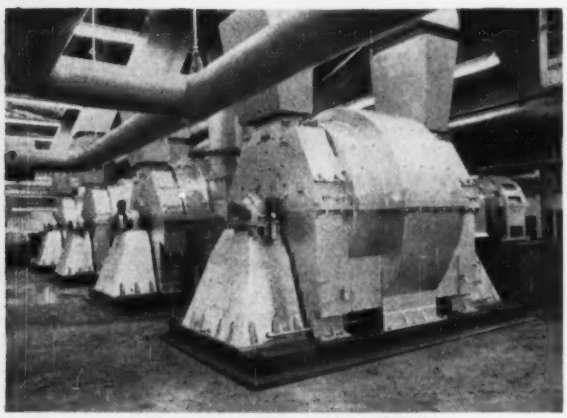
I-T-E CIRCUIT BREAKER COMPANY • Switchgear Division



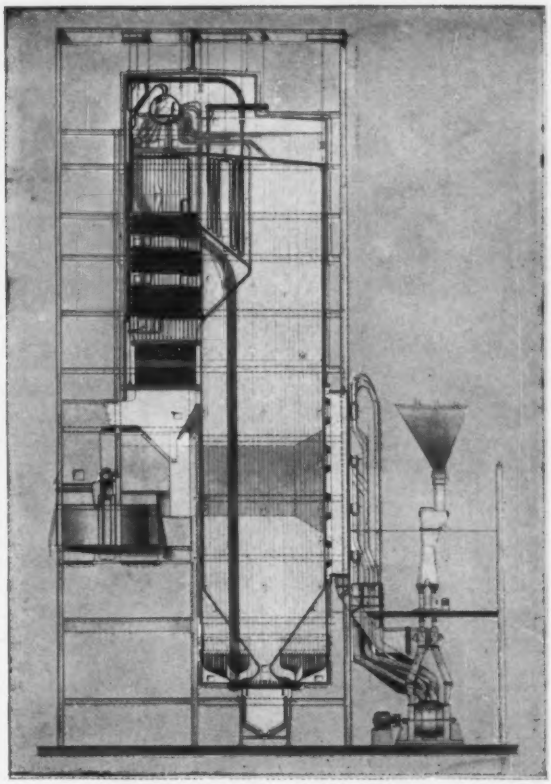
On the line . .

Actual unretouched burner elevation view inside Picway's Riley Furnace after 80,000 tons of low ash fusion temperature coals had been fired. Low incidence of slag formation around burners is due to the Riley design of water-cooled burner throats.





Eight Riley Coal Feeders at Picway Station accurately meter the coal to four Riley Duplex Pulverizers. Riley Pulverizers are distinguished for their quiet, smooth, vibrationless operation, their ability to respond to rapid load swings, and their ability to handle wet coals. Tungsten Carbide faced pulverizing elements assure sustained high fineness and low maintenance.



THE new 100,000 kilowatt electric generating unit recently placed in service at Columbus and Southern Ohio Electric Company's Picway Generating Station located a few miles south of Columbus, Ohio, is supplied by a 900,000 lb/hr. Riley Unit that is designed to operate as a swing load unit using Ohio Strip Mine Coals.

The unit features an ample furnace and is fired by four Riley Duplex Pulverizers and twelve Riley Flare Type Coal Burners. This combination of Riley equipment is ideally suited to meet the wide swings in load of the new generating unit.

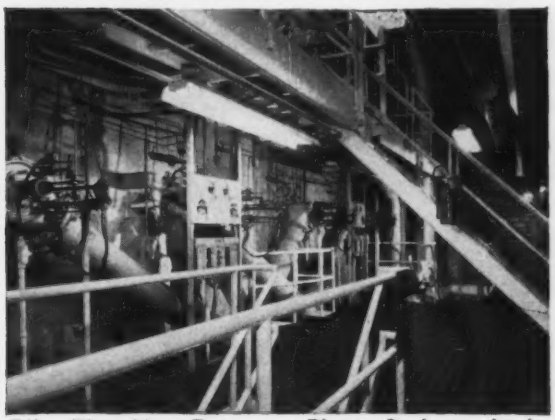
Picway's New Riley Unit

This new generating unit of Picway Station increases the total installed generating capacity of Columbus and Southern Ohio Electric Company to 560,000 kilowatts, representing an increase of 165% during the past 10 years.

Engineering Data

Maximum steam capacity —	900,000 lbs/hr.
Design Pressure	1500 psig
Steam Temperature	950 F

Commonwealth Associates, Inc., Engineers



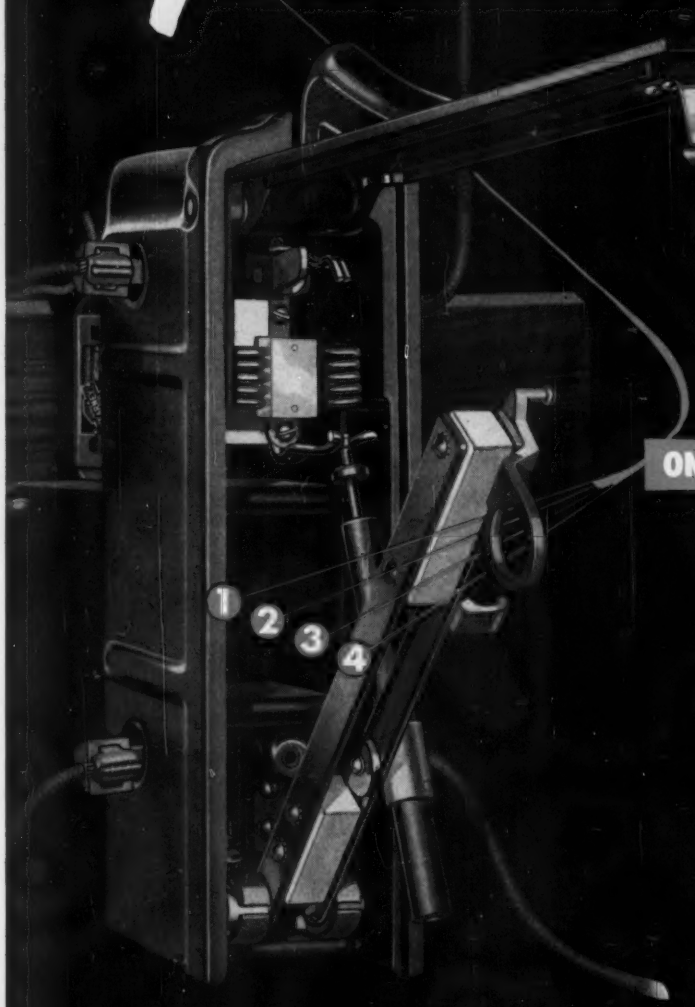
Riley Flare Type Burners at Picway Station maintain continuous, stable ignition at low loads. A common air duct supplies secondary air. Direction and rotation of burner flames is by remote control.

A survey of your plant by a consulting engineer could show ways of making surprising savings in your power costs.

RILEY
Stoker Corporation
WORCESTER, MASSACHUSETTS

Sales Offices: Worcester, New York, Philadelphia, Buffalo, Pittsburgh, Cleveland, Detroit, Chicago, Cincinnati, Charlotte, New Orleans, Atlanta, St. Louis, Kansas City, St. Paul, Houston, Denver (Englewood), Salt Lake City, Los Angeles, San Francisco, Portland, Seattle.

4 Switching Operations



of this KEARNEY BY-PASS DISCONNECT

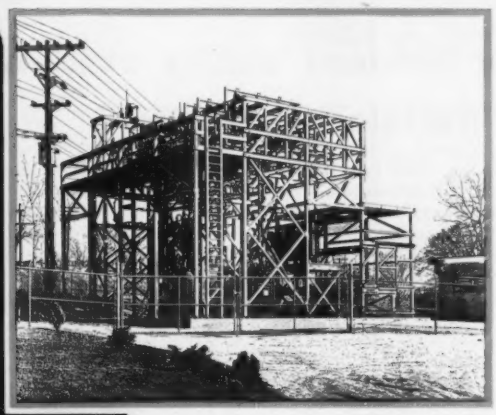
ONE PULL of the ring safely accomplishes four operations in proper switching sequence. . . without load disturbance or arcing at contacts. In the same time it takes to open one conventional disconnect, the KEARNEY By-Pass Disconnect shunts the line leads to by pass the regulator, opens both leads to the regulator, interrupts exciting current. Coordination of by-pass element action with blade movement assures positive make-before-break contact on switch opening and closing. And since only one By-Pass does the job of three single-throw disconnects, you save both time and money.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue • St. Louis 10, Missouri
Canadian Plant: Guelph, Ontario

with one pull

SURGE PROTECTOR

In localities subject to severe lightning conditions, KEARNEY Surge Protectors should be mounted across the line terminals of By-Pass Switches. They are set to break down on surges in excess of 12,000 volts. If an abnormal voltage surge initiates an arc across the blades or terminals, the Surge Protector interrupts the arc or power flow which would otherwise be sustained by the secondary voltage of the regulator.

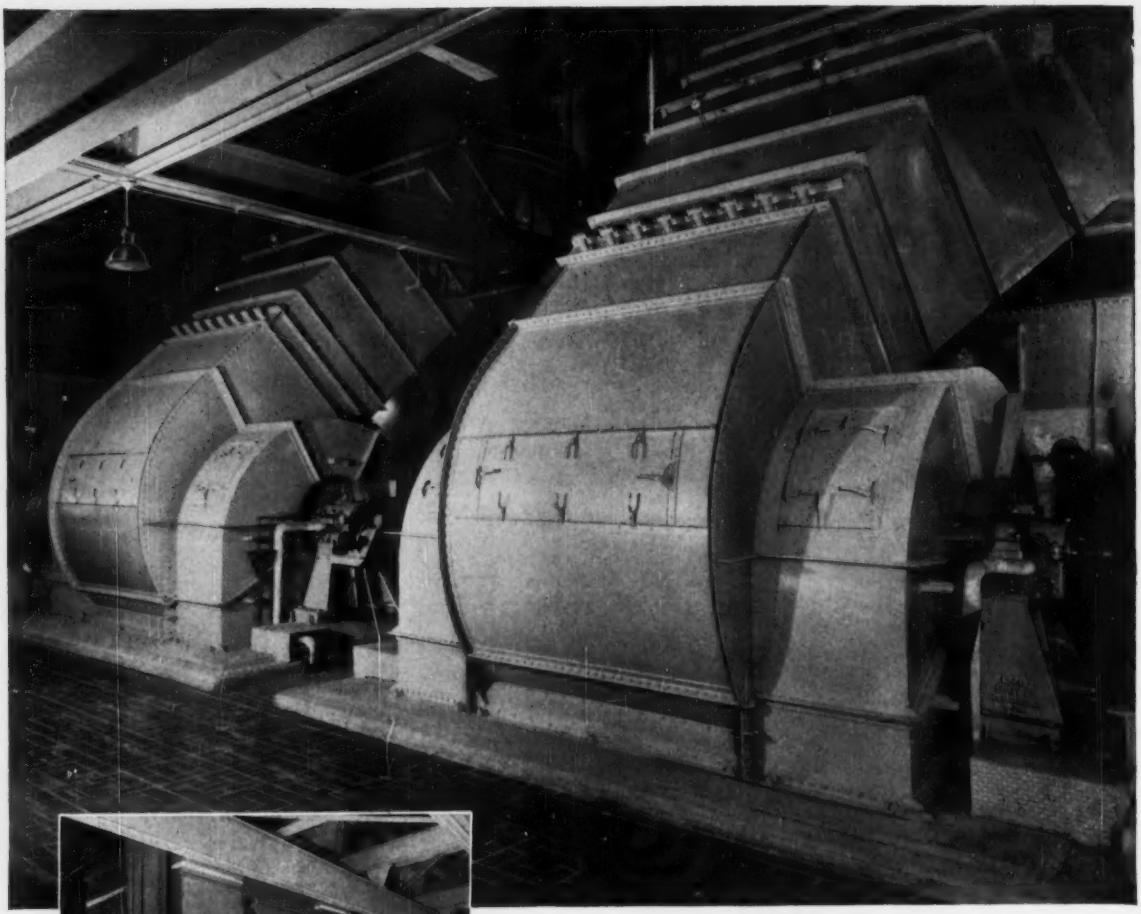


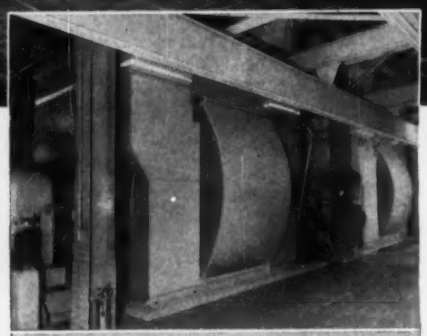
Switches Field-Tested

Here at KEARNEY'S Substation Laboratory of 150,000 KVA Transformer Capacity—with a back up power of 445,000 KVA—all equipment is tested under rigorous field conditions. KEARNEY Certified Ratings are actual, proved performance ratings . . . not just theoretical calculations. You can be sure they will do the job they are supposed to do . . . with a generous margin of safety.

-315

for BETTER CONSTRUCTION
SAFER MAINTENANCE
Specify
JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.
The Mark of Quality
KEARNEY PRODUCTS





Top Photo: Two "Buffalo" Forced Draft Fans recently installed in a large Ohio Valley utility station. "Buffalo" outlet damper control.

Two "Buffalo" Induced Draft Fans in the same new power plant. These ruggedly built fans have both the endurance and high efficiency to provide the greatest draft economy.

another modern utility station using "Buffalo" fans

"Buffalo" Mechanical Draft Fans have always been the choice of leading utility stations, as well as industrial plants, because of their famous "Q" Factor* construction — the "Q" Factor of bonus strength, accessibility and outstanding efficiency. Their low maintenance costs and their economy of driving power combine to give the lowest possible draft costs. Thousands of "Buffalo" installations are proof of it.

And, to match the exact conditions under which you plan to operate, "Buffalo" offers you a complete choice of tested and proven blade designs — backward curve, our new deep-bite airfoil wheel, radial and forward curve blades.

Assure this important part of your power production—specify "Buffalo". Write for Bulletin 3750 or contact your nearby factory-trained "Buffalo" Engineering Representative.

**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

There's more in this barrel for you...

S. F. Ketcham, Socony Mobil Field Consultant, analyzes oil circulation system design at drafting board stage.

MORE MACHINE BUILDERS' APPROVALS
to help improve production and lower unit costs

Specify Socony Mobil—and you get petroleum products approved by more machine builders than those of any other oil company. And no wonder. Our engineers have always worked closely with designers and builders. They advise on hydraulic and lubrication system design . . . suggest *correct* products for each machine—to help improve your production, lower unit costs.

Socony Mobil products are also backed by *more* field engineers serving industry . . . *more* services for analyzing petroleum products in use . . . *more* on-the-job training of your personnel in correct product application . . . *more* continuous research to assure continually improved products . . . *more* practical experience—90 years!

* * *

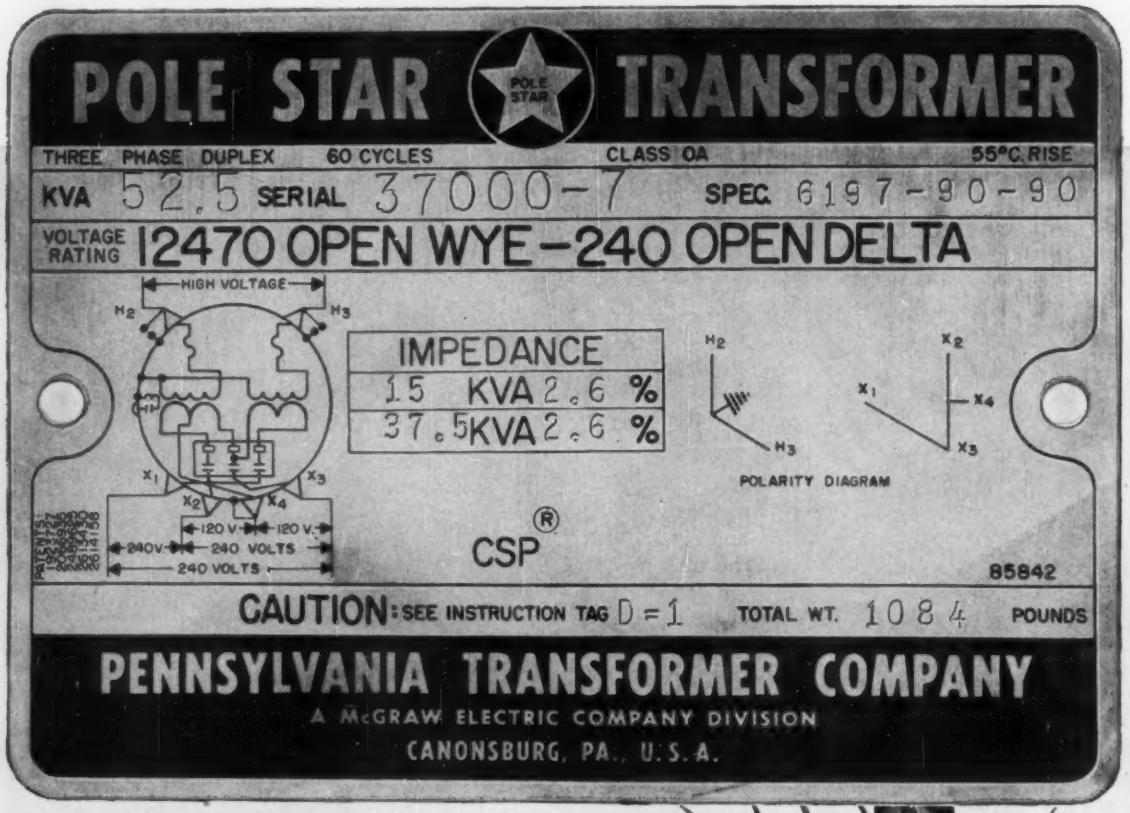
Always specify Socony Mobil. There's *more* in every barrel for you!

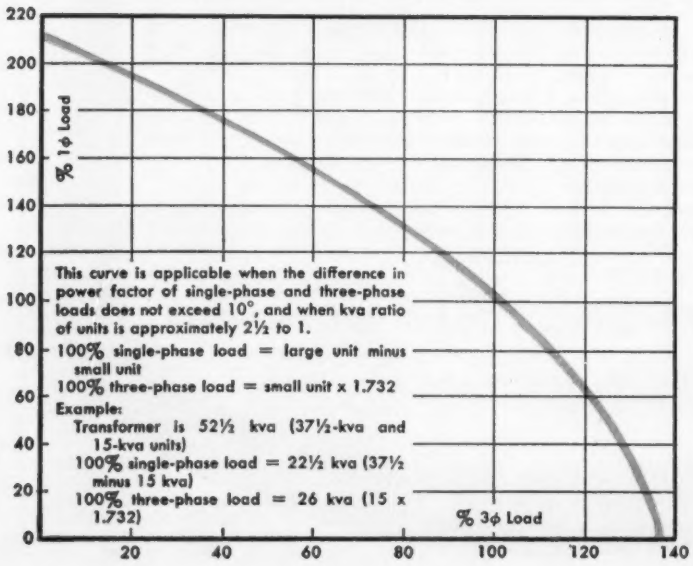
SPECIFY **SOCONY MOBIL** FIRST STEP IN CUTTING COSTS

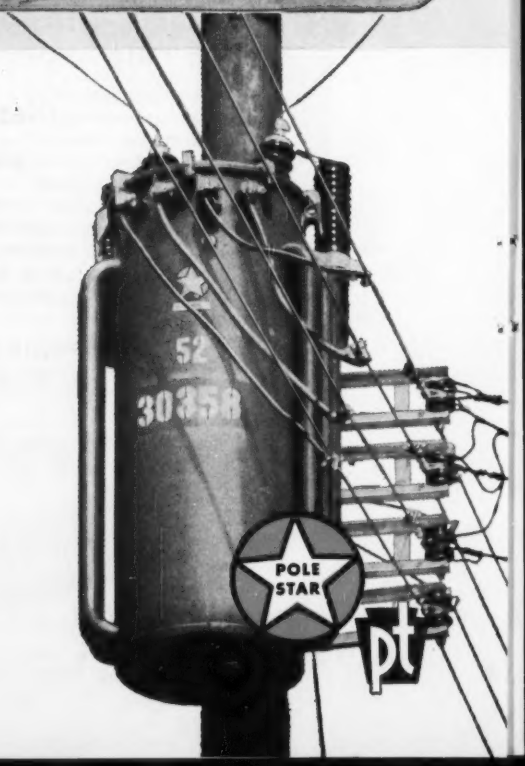
SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY
GENERAL PETROLEUM CORPORATION

LUBRICANTS • FUELS • CUTTING FLUIDS • WAXES • SOLVENTS • PLASTICIZERS • PETROCHEMICALS

Announcing the NEW







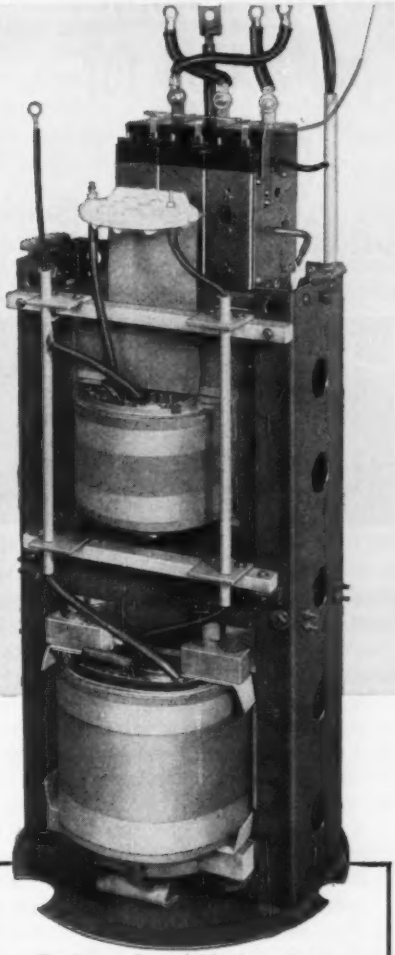
POLE STAR® DUPLEX TRANSFORMER

for Simultaneous Single- and Three-Phase Service from a Single Pole-Mounted Transformer

Pennsylvania's new Pole Star Duplex Transformers provide an efficient, economical answer wherever multiphase service is required from pole-mounted transformers. This is especially true in areas where three-phase air conditioners are used. By eliminating the need for banks of two or three units, Pole Star Duplexes simplify installation . . . lower initial costs. Mounted directly to the pole, the new duplexes require no extra cross-arms . . . make a neater appearance than do banks of transformers.

Pole Star Duplex Transformers are composed of two standard core-and-coil units mounted in a single tank — the most common combination being 37½ and 15-kva units to provide a total capacity of 52½ kva. The units are connected in open wye, open delta as shown on the opposite page, and may be equipped with CSP protective equipment.

Like all other Pole Stars, the new duplex transformers feature Pennsylvania's patented lap-on-top core. Thus, you can solve multiphase power problems and also get the low exciting current and low core loss for which Pole Stars are noted.



The internal assembly shown here is a 52½-kva Pole Star Duplex, formed by combining 37½-kva and 15-kva units. Other available ratings are: 20 kva (15 and 5 kva) . . . 35 kva (25 and 10 kva) . . . 40 kva (25 and 15 kva) . . . 62½ kva (37½ and 25 kva).

A Southwestern Utility Writes of These "Distinct Advantages" of Duplex Installations

1. "Their appearance is better. This becomes more and more important as the rapid increase in three-phase residential load requires more transformer installations very close together.
2. "In the event of trouble or overload on the secondary, all three phases will be interrupted by the CSP breaker*, not permitting single phasing due to secondary trouble.
3. "May be more readily installed on existing poles.
4. "More adaptable for use on poles where secondaries are dead-ended.
5. "Heat dissipation of large tank, common to both single-phase units, permits greater flexibility in overloading one or the other of the single-phase units."

**Pole Star Duplex Transformers are available either with or without CSP protective equipment.*

PENNSYLVANIA TRANSFORMER COMPANY

A McGraw Electric Company Division **CANONSBURG, PA.** *Greater Pittsburgh District*

NOW

S&C positrol fuse links

provide complete protection for pole-top capacitor banks

S&C Positrol Fuse Links will give you adequate, economical protection of pole-mounted capacitor banks—even considering the more difficult fusing requirements of ungrounded wye-connected banks.

Available in a complete series of ratings, Positrol Fuse Links have a margin of safety to withstand overload conditions and short duration transient currents considerably above ratings. Unnecessary outages are eliminated, but fuse action is rapid and dependable in the event of a faulted capacitor.

And, since these fuse links employ the S&C magnesium borate "Arctrol" sleeve, interruption of low-current faults is faster, more effective, and less violent.

Information Bulletin 500 explains in detail "The Fusing of Pole-Mounted Capacitors." It provides application tables to facilitate the selection of the correct fuse links for every capacitor fusing problem. It should be added to the technical library of every distribution engineer.

Write for new Bulletin 500 which gives valuable information on capacitor bank fusing.

Specialists in High-Voltage Circuit Interruption since 1910

S&C ELECTRIC COMPANY

4421 RAVENSWOOD AVENUE • CHICAGO 40, ILLINOIS, U. S. A.

In Canada: S&C Electric Canada, Ltd., 8 Vansco Road, Toronto 14, Ontario

POWER FUSES • DISTRIBUTION CUTOUTS AND FUSE LINKS • LOAD INTERRUPTERS • METALCLAD SWITCHGEAR

ELECTRICAL BUSINESS OUTLOOK

Electrical World
AUGUST 6, 1956

Coal will become more and more attractive to utilities with multi-fuel burning boilers. You get that impression when you consider the vast (and profitable) market for fly ash described by various speakers at the fly ash conference sponsored by Electrical World in Pittsburgh last week.

Highway construction alone in the next 13 years could very easily consume more than 12 times the current annual production of 8¼ million tons of fly ash. Add another 20 million ton annual market for sintered fly ash in building blocks and you already have a shortage of fly ash pointing to the use of more coal.

• • •

Higher boiler efficiencies will also add to the attractiveness of coal. R. C. Wenz, purchasing agent, Duquesne Light Co, indicates that boilers operated to maintain a uniform fly ash carbon content against a specification (for concrete and concrete products) tend to improve in efficiency. Thus coal, which already provides about 29% more BTU's than the equivalent amount of oil for the same average price, will take an even greater lead.

Power plant design will be in line for further study when fly ash sales get rolling. Savings on fly ash disposal costs (which could run around $16 million a year) will justify the expense. A consideration of the economies of fly ash sales in the initial phases of plant design will undoubtedly lead to efficiencies in burning and collecting equipment—another plus sign for higher coal use.

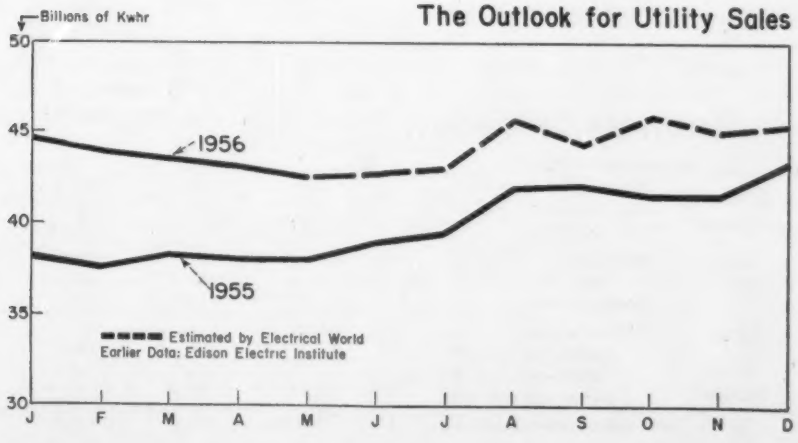
Price differentials between grades of fly ash will also justify design changes, contends J. B. Homsher, purchasing manager for Gilbert Associates, Inc. Such changes, says Homsher, would take the form of larger mills, higher volume furnaces, combination dust collectors (to separate fine and course ash) and separate silos for each grade of fly ash dust.

• • •

Coal and aluminum prices will be next in line (after steel) to push costs even higher before the year is out. Current wage negotiations in both industries are expected to reflect the steel industry wage pattern. This spells out a healthy boost in wages that will surely be passed along to customers through higher prices.

FPC peak load estimates continue to climb. The commission's May estimate sets next December's peak at almost 106 Mw. This is 7.8% higher than last year's peak and 2.5% higher than FPC's estimate made in May of last year.

The Outlook for Utility Sales



STATISTICS

Generation per Kw of Installed Name Plate Capacity

(Kilowatt-hours)

	Total Electric Utility Industry	Investor-Owned	Cooperatives	Government-Owned
1955*	5,037	5,066	3,889	4,975
1954	4,860	4,935	3,620	4,634
1953	5,096	5,227	3,352	4,670
1952	5,053	5,173	2,986	4,659
1951	5,124	5,233	3,152	4,737
1950	4,986	5,051	3,585	4,749
1949	4,865	4,863	3,489	4,899
1948	5,193	5,225	3,552	5,089
1947	4,983	5,056	2,434	4,688

*Preliminary

Source: Edison Electric Institute

Power Statistics . . .

			Latest Month	Preceding Month	Year Ago	Annual Change %
Capacity	million kw	May	117.43	116.78	106.32	10.4
Peak—Class I Systems	million kw	April	91.4	92.3	82.4	10.9
Estimated Dec. '56 Peak	million kw	May	106.00	105.88	103.44	2.5
Production—billion kwhr		May	49.09	47.49	43.35	13.2
Hydro			11.70	11.55	9.81	19.3
Fuel			37.39	35.94	33.54	11.5
Sales—billion kwhr		April	44.51	45.36	39.53	12.6
Residential			11.82	12.42	10.60	11.4
Commercial			6.70	6.84	6.15	8.9
Industrial			23.53	23.69	20.42	15.2
Other			2.46	2.40	2.36	4.2
Fuel Consumption		May				
Coal—million tons			12.05	11.95	10.76	12.0
Oil—million barrels			4.47	5.76	4.88	−8.4
Gas—billion cu. ft			110.51	89.72	103.43	6.8
Net Income Class A & B Co's—$ million		May	103.15	115.46	92.7	11.3
Residential Customers—millions		12 mos.	44.76	44.67	43.51	2.9
Revenue per kwhr		ended	2.62¢	2.63¢	2.67¢	−1.9
Avg kwhr per customer		April 30	2,838	2,819	2,623	8.2
Avg annual bill			$74.36	$74.12	$70.01	6.2

Business Statistics . . .

Indexes: 1947–49 = 100					
FRB Industrial Production	June	141	141	139	1.4
ENR Construction Cost	July	145.6	145.1	138.4	5.2
BLS Cost-of-living	June	116.2	115.4	114.4	1.6
NEMA Sales	April				
Insulation materials		163	168	160	1.9
Electric appliances		111	120	102	8.8
Wholesale prices	April				
Motors and generators		130.4	126.9	120.5	8.2
Transformers and regulators		135.3	133.1	127.3	6.3
Switchgear and fuses		149.0	147.8	135.5	10.0
GNP—annual rate—$ billion	1st Qtr.	398.5	397.3	375.3	6.2

Your Business

Flight experience course for businessmen. With more company planes in the air, an increasing number of utility men are itching to get their hands on the controls. University of Illinois' Institute of Aviation is using a 13-lesson course for students which it believes is easily adaptable to the desires of businessmen. It's designed for those whose curiosity is not yet to the point where they desire a complete private pilot course.

The course used by the institute requires ten hours of flight, two hours of flight observation, two hours of lecture, and two hours of ground observation. On a no-profit basis, charge for the course is $75. Full description is in Aeronautics Bulletin 19 from Institute of Aviation, University of Illinois, Urbana.

• • •

Night 'round air-conditioning. New air conditioners are bringing comfort to a host of owners this year. One customer is particularly well pleased with his cooling unit. It worked so effectively on a recent night that the automatic furnace turned itself on.

• • •

Electrical lighting has had its setbacks. When London's Billingsgate fish-market was lighted with "Joblockhoff candles" in 1879, there was an immediate outcry from the fishmongers. Harpers Bazaar for June of that year reports the lights were just too good. It made the fish look shiny and old and forced the prices down. As a result the electricity was banished and gas lights restored.

"Keep your eyes open, Gus. I think I heard that bear again."

• • •

For your working philosophy: Worry is like a rocking chair—gives you something to do, but doesn't get you anywhere.

Your Health — Deformities and Miracles:

REX H. WILSON, MD, Medical Director, B. F. Goodrich Co

There is nothing more pitiful than the person who is suffering from rheumatoid arthritis. This tragic human being is not only suffering from severe joint pain, but he is also being markedly deformed by the destruction taking place in his joints. This inflammatory joint disease, affecting more women than men, varies in severity. In some only a few joints are involved—in others, many. It can be mild, then "flare up" into a torturous nightmare. In its advanced stages, there is muscular wasting, loss of weight and strength and loss of appetite.

The cause is unknown. It is suspected that there is some relation between certain glandular secretions and the disease. Emotional stresses and strains are also probable factors. Statistically, areas with a damp, cold climate have a greater occurrence of rheumatoid arthritis. Actually, climate does not affect the course of this sad and painful disease.

X-ray examinations and laboratory tests can usually make a positive diagnosis. Cases treated early have the best results. Rest, a well-balanced diet and physiotherapy are all beneficial. Physicians now have the miracle cortisone drugs. These drugs control, but do not cure rheumatoid arthritis. They have literally transformed some human wrecks into useful citizens.

Many other drugs are being used with some success. Because the disease is so severe and because there is no specific cure, many patients have turned to the "quack" with the "sure cure." Rest assured, your physician knows all of the tested modern remedies.

Human misery is appalling to behold. Medical science is dedicated to the relief of it. Today we enjoy some measure of control of rheumatoid arthritis. Tomorrow we may have the cure.

WASHINGTON COMMENT

Should Ike Oust Strauss?

Observers call for Administration to discharge its AEC chairman as a "political liability"; Rep Cole of New York is logical successor

V. CRAIG RICHTER, Washington Correspondent

The feeling is growing in Washington that Atomic Energy Commission Chairman Lewis Strauss has become a political liability to the Eisenhower Administration.

Even those who have the highest regard for Strauss' ability point out that he has been less than effective in his public relations.

More important though, Strauss is the focal point of criticism aimed at this country's atomic power program. With the defeat of the Gore reactor bill, Democrats will be hitting hard at the Administration's atomic power program. Strauss clearly has become the symbol of everything they consider wrong with that program.

Strauss is attacked on two fronts: His position as AEC chairman, and his role as presidential adviser on atomic matters. Democrats charge that on one hand Strauss is responsible for the lag in the American atomic power program, and on the other, he is misinforming the President. They cite his role in Dixon-Yates and a number of other events which have had unfortunate repercussions.

Regardless of who is right or wrong, observers say the situation now is this:

1. Defeat of the Gore Bill has left the Administration vulnerable. It has to demonstrate concretely that the country's atomic power program is moving ahead.

2. The recent charges have left a gnawing suspicion that maybe the U.S. is lagging behind other countries in atomic power development. Given weight are statements by such people as Dr Walter H. Zinn, Robert McKinney, and others.

3. Almost every piece of atom news out of Europe will provide the Democrats with political material to bolster their point that the U.S. is losing the international atomic race.

Observers believe Eisenhower could meet Democratic charges in one of two ways. One would be a stepped-up program of nuclear power development. But Democrats could latch on to this as proof that the Gore Bill proposal was right after all.

The other course, which observers say has more merit, would be replacement of Strauss.

If the Administration should adopt the second course, who would replace Strauss? Here, observers say, the name of Rep W. Sterling Cole (R-N.Y.) suggests itself as the most logical choice to neutralize Democratic criticism. He is on the Joint Congressional Committee on Atomic Energy.

Joint-Atomic Energy Committee Chairman Clinton Anderson (D-N. Mex.) long has favored Cole for this job, and Cole reportedly would accept it. He would have both Republican and probably unanimous Democratic support.

Eisenhower may well feel that Strauss is too big a liability to carry. It is true, the President has stuck by Agriculture Secretary Benson and Defense Secretary Wilson, but in these cases he believes implicitly in their programs. On the other hand, he wasn't unwilling to let Secretary Douglas McKay go when attacks on Interior gained momentum.

TECHNICAL NOTES

Surge protection at generator terminals can be omitted when entire bus is enclosed to the main transformers which have reduced-voltage lightning arresters on the high side.

Voltage decay can trigger station service transfer to emergency sources during a generator shutdown if circuits essential to boiler control or operating convenience are first transferred manually.

Pipe-cable faults can be located precisely with pulsed dc tracer current, exploring coil, and prod-equipped galvanometer applied to the pipe surface. Sensitivity of the galvanometer can be stepped up with portable amplifier.

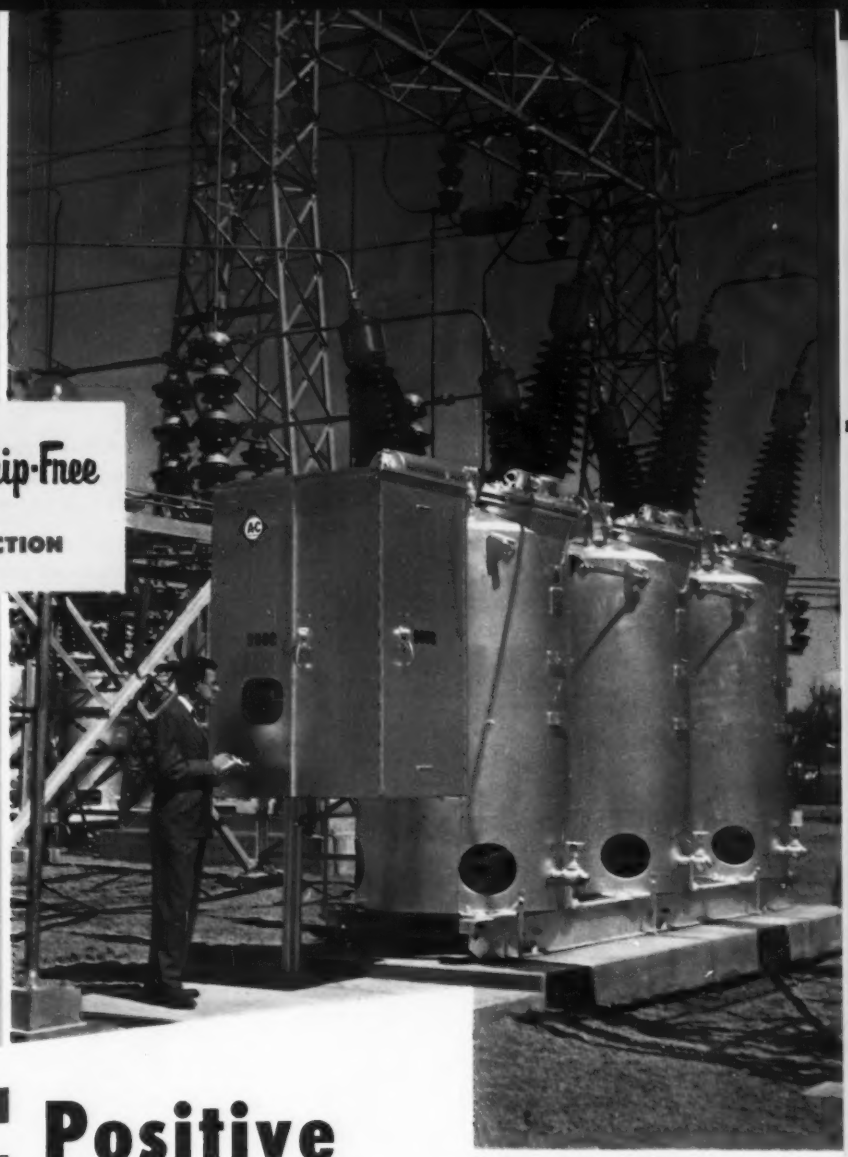
Electrical fires in British structures wired before 1925 show incidence nearly triple that of structures under 10 years old.

Yeddo hornbeam is a Japanese tree recommended by USDA for residential street and lawn planting in eastern U.S. This compact tree, they say, grows in most soils, looks taller than it is (rarely over 30 ft), and intrudes but little into utility wires or the street.

LOOK for this sign

this breaker

Mechanically Trip-Free
FOR
POSITIVE PROTECTION



A western utility installed this 115-kv Allis-Chalmers breaker with mechanically trip-free *Pneu-Draulic* operator early in 1955.

You Get MORE Positive Protection

When It's Built by Allis-Chalmers

. . . because *all* Allis-Chalmers breakers are Mechanically Trip-Free. This means that contacts open at full speed under all conditions. Simple uncoupling linkage permits contacts to open independently of closing mechanism. *Pneumatically or hydraulically trip-free breakers cannot give you this protection.*

For details of this and other features, such as the *Pneu-Draulic* operator and the completely tested *Turbo Jet* interrupter, call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Pneu-Draulic and *Turbo Jet* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-4982

Advanced Design

Means: Reduced Weight / Easier Handling / Versatile Installation

Advanced design features make these Allis-Chalmers potential transformers smaller and lighter than ever before. This reduction in size and weight results in space-saving transformers that are easier to handle and simpler to install.

NEW compact design also results in improved performance in both ratio and phase angle.

NEW potential transformer ratings have been added to include higher voltage classes.

Best of all, with these smaller, lighter units, you still get all the maintenance-cutting, long-term economy features you expect from Allis-Chalmers.

ALLIS-CHALMERS Potential Transformers

POTENTIAL			
Two-Bushing Transformer			
TYPE	Insulation Class	Height	Weight
SPW-2	25	38½	280
SPW-3	34.5	40½	310
SPW-4	46	48½	615
SPW-6	69	61	1160
SPW-11	115	86	3400
Single-Bushing Transformer			
SPW-21	25	41	260
SPW-31	34.5	44¼	285
SPW-41	46	50¾	460
SPW-61	69	63¾	950
SPW-111	115	92	2310
SPW-131	138	112	3510

Get all the information on these modern lightweight transformers. Contact your nearby A-C district office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

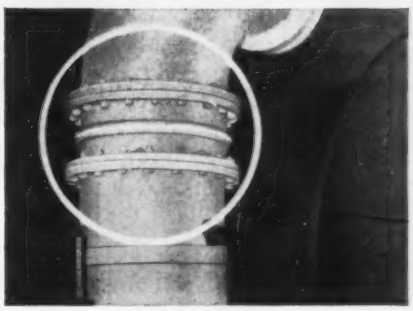
LIVE BETTER ELECTRICALLY

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

A-5125

How long can a U. S. Rubber Expansion Joint last



...some have been on the job since 1926, the year they were invented!

Here are just a few reasons why *these flexible connections are used in pressure or vacuum pipe lines...*

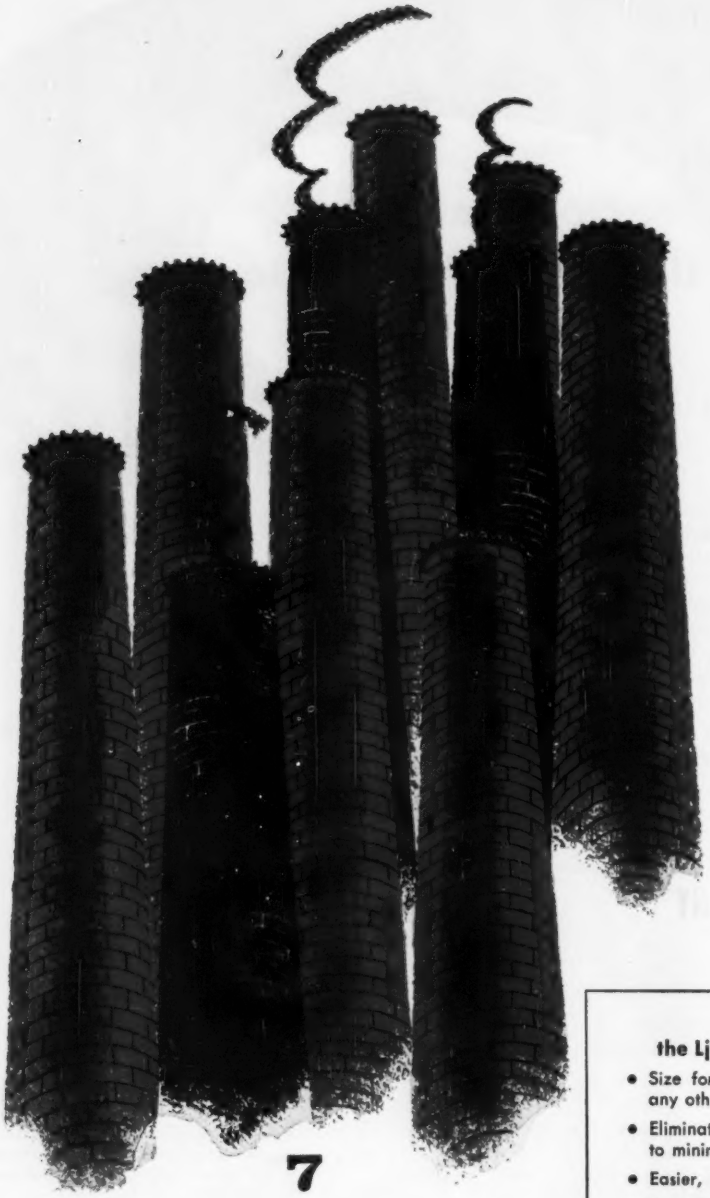
- U. S. Rubber Expansion Joints are resilient and, therefore, do not, like metal, set permanently when compressed.
- Constant flexing merely keeps "U. S." joints "alive"...prevents them from becoming brittle.
- They absorb both axial *and* lateral deflection far more than metal joints. Greater insulation against vibration and pump noises is provided.
- There is never any electrolysis, corrosion or erosion.
- U. S. Rubber joints handle pressures from 40 lbs. to 125 lbs. Compare!
- The outside diameter of the arch is smaller than that on metal joints. Face-to-face dimensions (even with multiple arches) are smaller.
- Weight is much less. This, plus the fact that no gasket is needed between flanges (unlike metal joints) results in an easier installation, lowering the cost.

"U. S." was the first to develop rubber expansion joints. They are at work in every kind of industry, prolonging the life of equipment in pressure or vacuum pipe systems. Obtainable at any of the 28 "U. S." District Sales Offices, or write us at Rockefeller Center, New York 20, N. Y.

US RUBBER

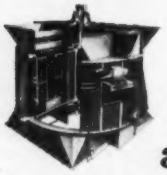
Mechanical Goods Division

United States Rubber



Advantages of the Ljungstrom Air Preheater

- Size for size, recovers more heat than any other type.
- Eliminates cold spots . . . keeps corrosion to minimum.
- Easier, faster to clean and maintain.
- Requires far less supporting steel and is quickly erected.

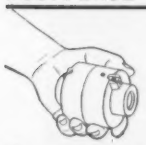


7 out of 10. . . air preheater installations are Ljungstrom®

MAXIMUM HEAT RECOVERY is one important reason. As a general rule, a height of one inch of the heating surface used in a Ljungstrom Air Preheater will recover about as much heat as one foot of length of the standard surface of conventional type air preheaters. For the interesting full story, send for a free copy of our 38-page manual.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

POLYPHASE METERING:



Current transformers provide built-in adaptability for future load growth

When polyphase loads go over 100 amperes—it's time to install Sangamo Type R Current Transformers. Their unique adaptability encourages simple economical installations that eliminate the need for larger self-contained meters which have only limited capacity for still further expansion.

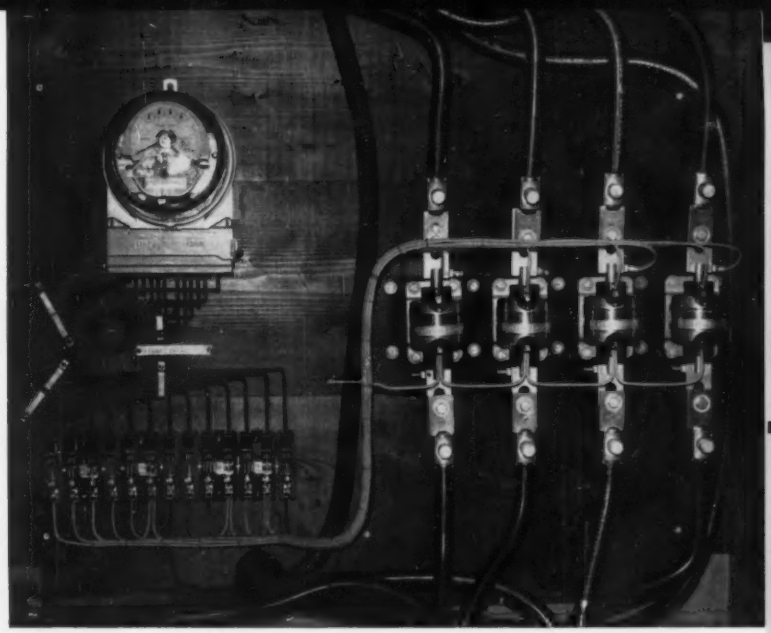
Sangamo Type R Transformers can be used as bar-primary-types or window-types, with or without auxiliary mounting plates, and are light enough to be fully supported by the primary conductor.

Available in 200 and 400 ampere ratings, in eight variations that permit almost any primary arrangement.

Ask your Sangamo Representative, or write us for Bulletins 501 and 150 for detailed information on Type R Transformers and mounting racks.

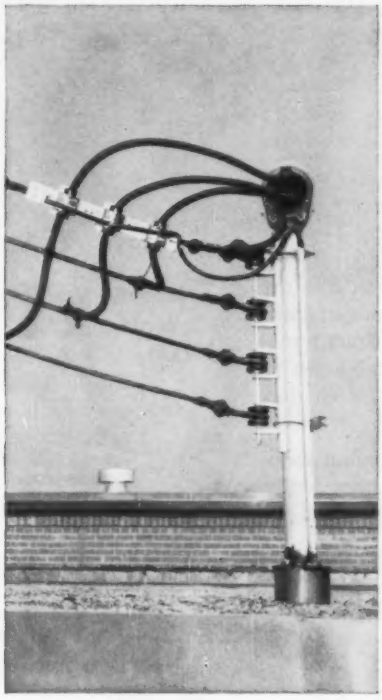
SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

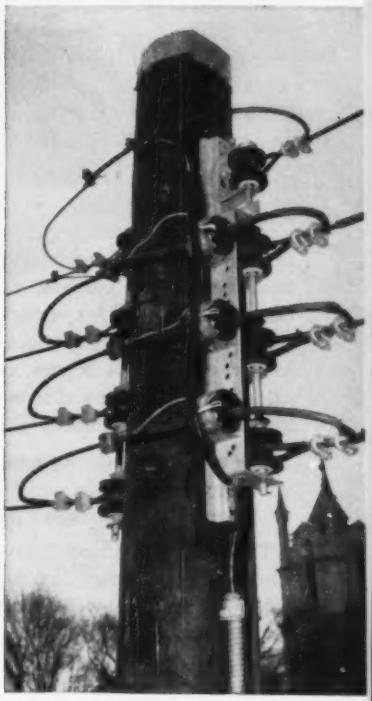


This 4-wire Delta meter box installation uses four Type RF-6A Sangamo Current Transformers.

Three Type RC-6A Current Transformers are supported on a horizontal secondary wire Sangamo Transrack.

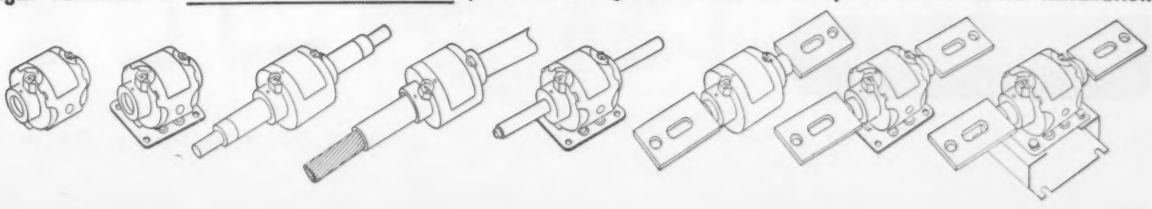


Service entrance mast installation with three Sangamo Type RC-6A Transformers mounted on a Transrack supported by the grounded neutral.



This pole-top installation shows three Sangamo R-6 Current Transformers supported by the secondary rack.

Eight variations of ONE BASIC TRANSFORMER permit the engineer to devise many other economical installations.

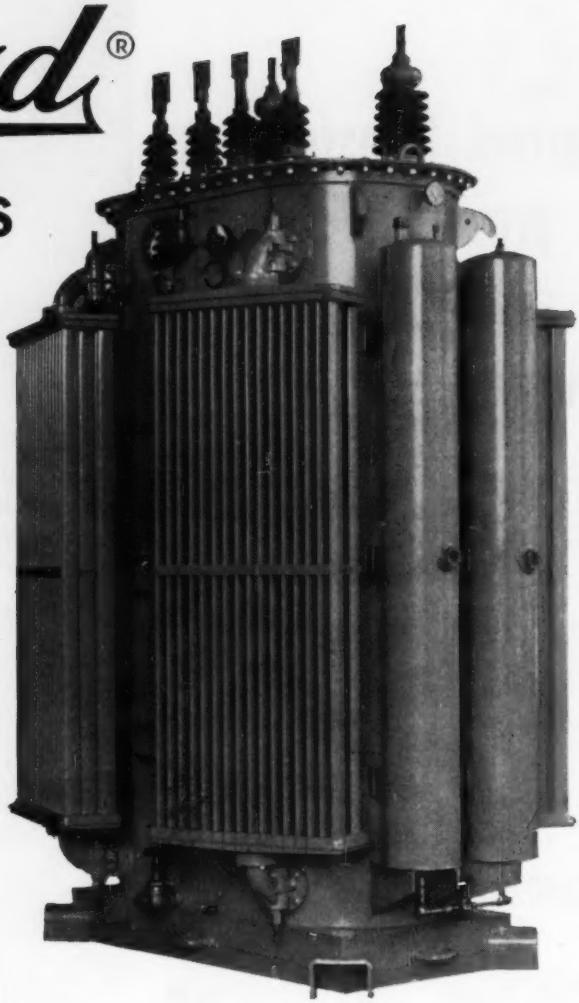


SM56-B

Standard®

POWER TRANSFORMERS

efficient . . .
economical . . .
dependable



2500 KVA, single-phase, OISC power transformer, 34,500 volts primary, 2400x4800 volts secondary. Special design to meet customer's specifications. Standard engineers will work with you to meet your requirements.

● Where power requirements demand above-average reliability and efficiency, Standard Power Transformers are your one best choice. Figures taken from service records show how Standard's sound engineering principles cut maintenance costs to the bone and boost transformer life.

Standard engineers work with your engineers to incorporate the transformer design features and specific components that meet your needs most efficiently. Bushings, tanks, finishes, covers, and accessories meet ASA specifications and are rigidly inspected by Standard. Each transformer, regardless of size, is subjected to all standard commercial tests—both during and after manufacture.

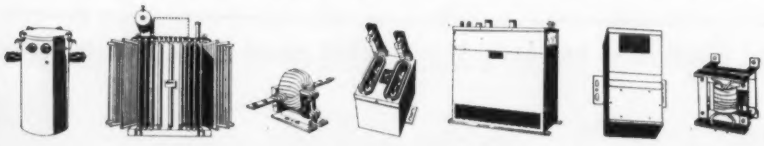
We can build transformers to your specifications as quickly and economically as if you'd bought repetitive designs.

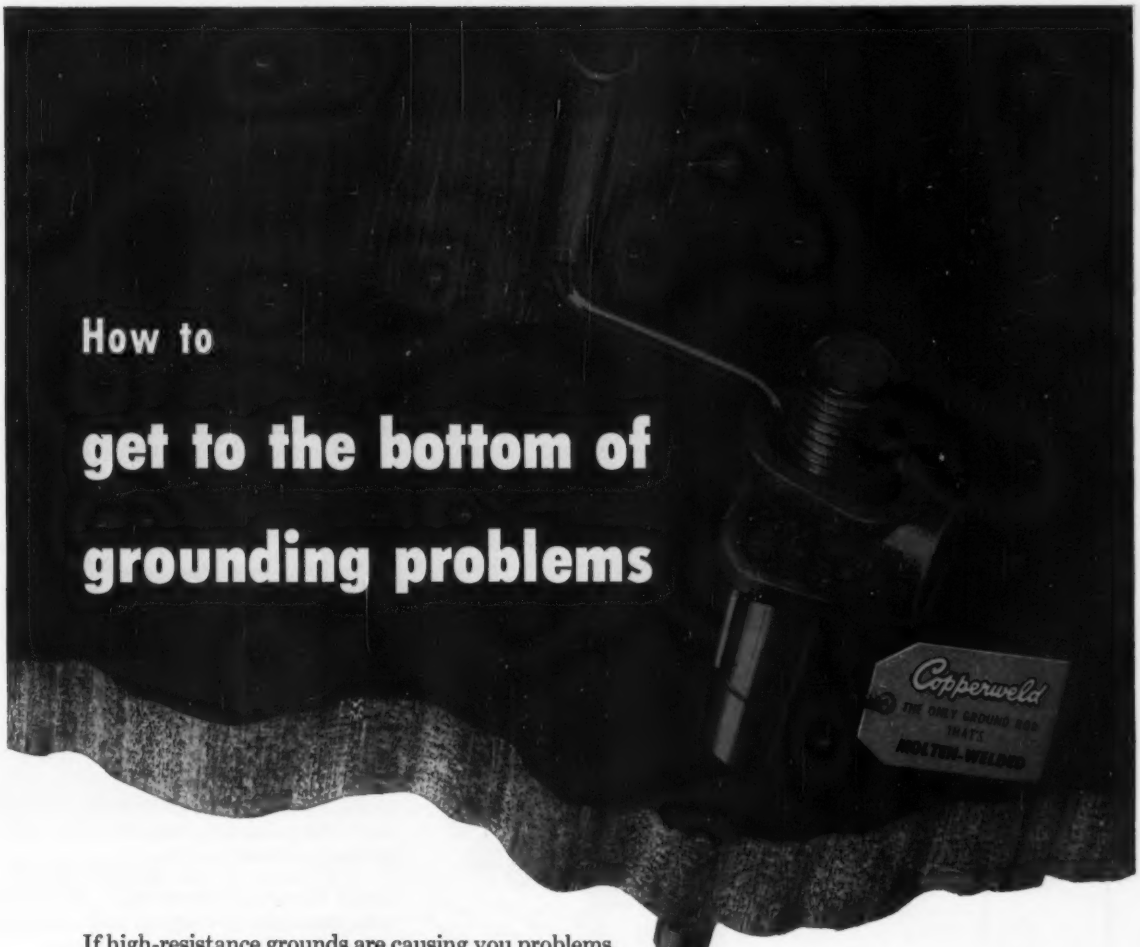
There's a Standard Transformer representative near you. Call him. He'll work with you to produce the best transformers you've ever used.

Standard®
THE STANDARD TRANSFORMER COMPANY

WARREN, OHIO
REPRESENTATIVES IN PRINCIPAL CITIES

Transformers
FOR EVERY APPLICATION





How to get to the bottom of grounding problems

If high-resistance grounds are causing you problems, here's a simple, low-cost way to solve them. Drive Copperweld* Sectional Ground Rods deep into the earth's sub-surface to reach permanent moisture, where resistance is always low.

By using this proved, practical method, you'll have dependable grounding protection every day in the year. And then you can be certain you'll always get the best performance from the protective equipment on your overhead systems.

Trade Mark

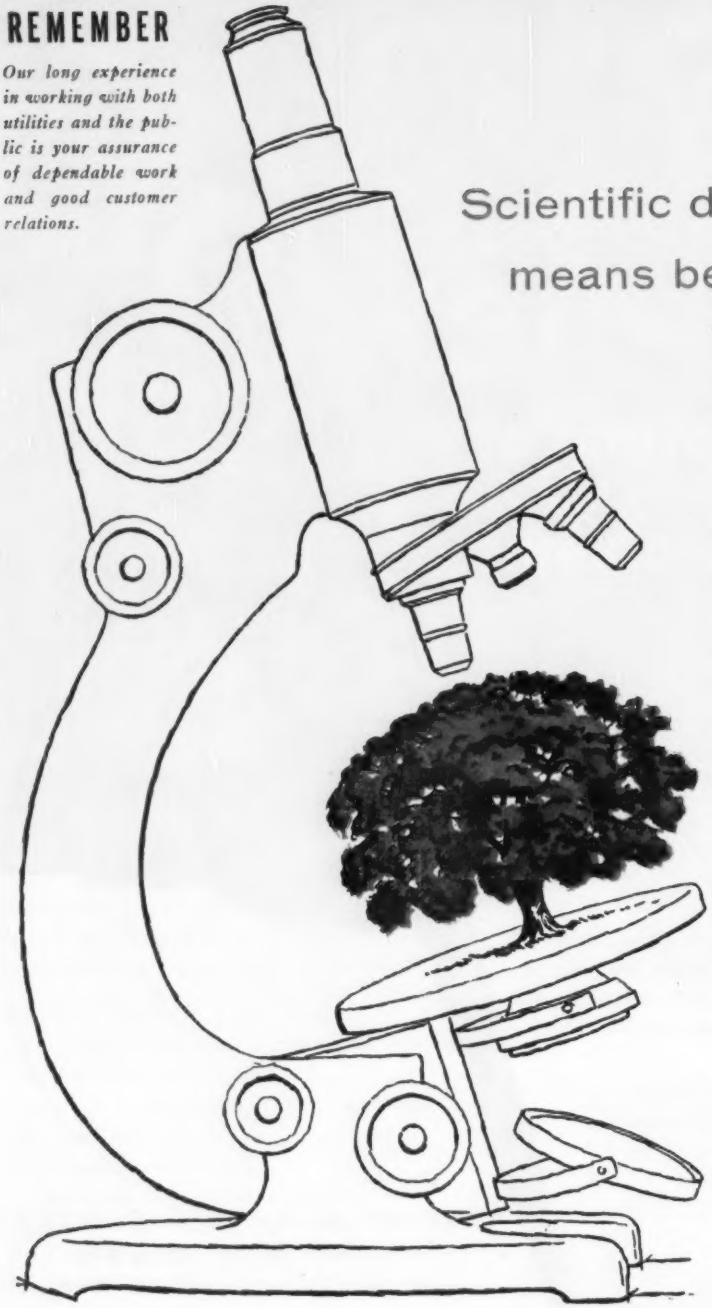
COPPERWELD STEEL COMPANY
WIRE AND CABLE DIVISION *Glassport, Pa.*
For Export: COPPERWELD STEEL INTERNATIONAL COMPANY, New York

GO DEEP with Copperweld TRADE MARK **sectional ground rods**

PERMANENT MOISTURE

REMEMBER

Our long experience in working with both utilities and the public is your assurance of dependable work and good customer relations.



Scientific diagnosis means better tree care . . .

The basis of any curative treatment for either plants or animals is accurate diagnosis, plus the skill and experience to bring it to a successful conclusion. This means research, not guesswork as well as the best of equipment and ability.

You won't see many tree laboratories comparable to our 200-acre experimental ground and research unit at Stamford, Connecticut, where the day-to-day problems encountered by our field men are diagnosed and ideas for the protection of shade trees are tested and developed under actual growing conditions. These laboratories call for a big investment in both time and money. But to us who want to be sure of results, this painstaking research for the best possible treatment is worth it.

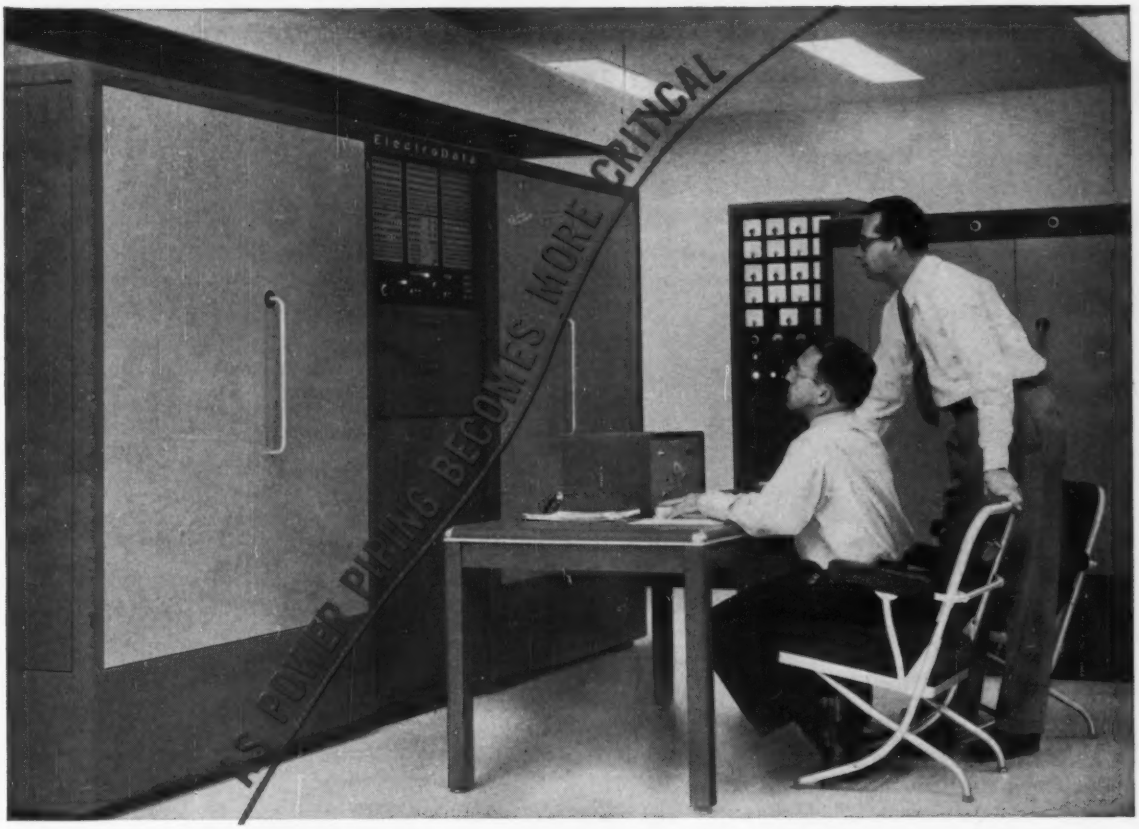
Couple this with an efficient highly skilled field force, thoroughly familiar with local conditions, and you have the well balanced Bartlett organization capable not only of rendering scientific diagnosis but of executing the prescribed treatment in efficient, economical fashion. It is the reason why more and more people are turning to the Bartlett Way—the Scientific Way. It costs no more and it is safer and more economical in the long run.

Consult your local Bartlett representative today for a study of your tree situation. You will benefit by his recommendations.

The Bartlett Way

BARTLETT TREE EXPERTS

Home Office, Research Laboratories and Experimental Grounds, Bartlett School of Tree Surgery, Stamford, Conn.
Local Offices from Maine to the Carolinas, and West to Indiana.
See your Local Telephone Directory for Local Address.



Kellogg's Design Calculation Techniques Keep Pace

Latest and most valuable electronic addition to The M. W. Kellogg Company's facilities for solving the design calculation problems of power piping customers is a new, large magnetic drum digital computer. It can execute 500 arithmetical operations per second; conservatively can solve 40 simultaneous equations in 30 minutes; and has a memory capacity of over 4000 ten-digit words. This computer is now in use at Kellogg's new New York Headquarters, and supplements a smaller computer which has been employed for some time at M. W. Kellogg's Jersey City laboratories.

This new computer enables The M. W. Kellogg Company's engineering staff to undertake a far greater number of precise calculations in less time than ever before and, as a result, to determine the optimum main and reheat steam piping designs for steam-electric power plants in minimum time.

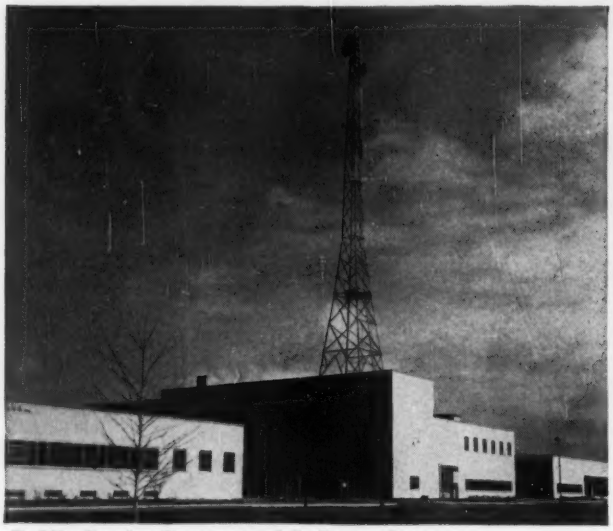
A cordial invitation to see the new Datatron computer at work is extended to consulting engineers, and to engineers of power generating companies and their equipment manufacturers. Appointments may be made by contacting the office of the Sales Manager, Fabricated Products Division, The M. W. Kellogg Company, 711 Third Avenue, New York 17, N. Y.

FABRICATED PRODUCTS DIVISION
THE M. W. KELLOGG COMPANY, 711 THIRD AVE., NEW YORK 17, N. Y.
A SUBSIDIARY OF PULLMAN INCORPORATED

The Canadian Kellogg Company Limited, Toronto • Kellogg International Corporation, London • Societe Kellogg, Paris
Kellogg Pan American Corporation, New York • Companhia Kellogg Brasileira, Rio de Janeiro • Compania Kellogg de Venezuela, Caracas

POWER PIPING—THE VITAL LINK

MICROWAVE COMMUNICATIONS:



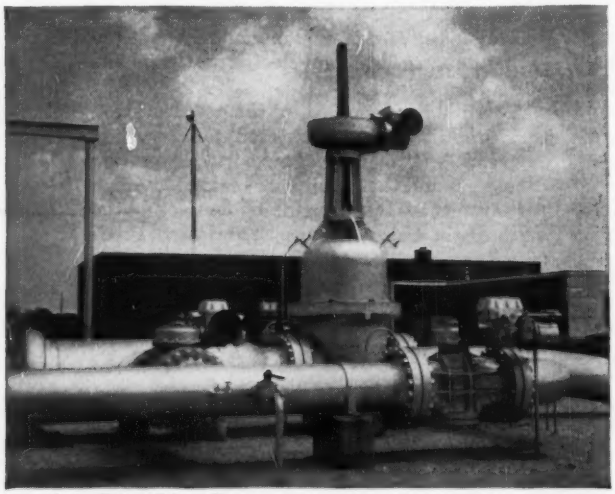
Public Service Company of Indiana, Inc.

Microwave radio aids in controlling supply of electricity for the state of Indiana. Four branches of a G-E Microwave system—combining voice and telemetering channels—originate at utility headquarters in Plainfield. From this hub regional demands are controlled according to local needs. Load control information obtained by remote control telemetering is analyzed, then transmitted to generating stations in necessary areas. Entire electrical power system is linked solidly by microwave radio.

Busy Tower

Antenna receives, transmits, or relays voice or telemetering signals. Antennas like these link headquarters with generating plants and sub-stations over a wide area.

P.S.I.'s microwave network provides utmost dependability because of standby equipment, fail safe feature, and because equipment can be concentrated at specific locations where it can be fully protected and easily maintained.



Sinclair Pipe Line Company

Microwave radio helps Sinclair coordinate flow of crude oil and oil products over many states—even turns pumps on and off. 7 voice, 4 telemetering channels link Cushing, Oklahoma and East Chicago, Indiana. Another channel permits remote control of 16 VHF radio base stations along the line which provide communication between over 100 radio-equipped vehicles and any company office in the microwave system. System is capable of providing up to 12 additional channels as needed.

Are microwave circuits your answer, too?

It depends.

What kind of service do you provide, how do you do it?

Let's assume that instant control and coordination of many functions, over long distances, are vital to your needs. Then you *should* investigate microwave because it is dependable, economical, and inexpensive to add additional circuits.

The services shown here *need* dependable voice and signal circuits. One controls the flow of crude oil and oil products over many states. The other uses microwave to link electric power facilities throughout one state.

Both use G-E Microwave Equipment for efficiency and economy. For additional microwave information, write: *General Electric Co., Microwave Equipment, Sect. X1986-6, Electronics Park, Syracuse, N.Y.*

Progress Is Our Most Important Product

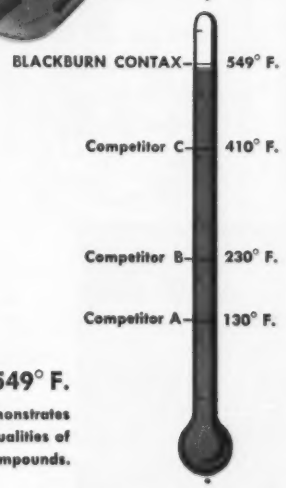
GENERAL ELECTRIC

BLACKBURN

IN NEW CRACK-PROOF CONTAINER

No messy, leaky tubes . . . no wasted paste

Blackburn Contax's new, no-leak plastic container will save time and tempers on the job . . . besides saving money in wasted material due to "throw-away" losses from cracked tubes. Contax is a mineral base grease with non-gassing zinc dust held in suspension. Zinc particles penetrate the oxide film, improving connection electrically—compound seals out air and moisture and protects against galvanic corrosion.



NO DRIPPING UP TO 549° F.

The thermometer chart at right demonstrates the superior heat resisting qualities of *CONTAX* over competitive compounds.

Available at electrical wholesalers everywhere

JASPER BLACKBURN CORPORATION

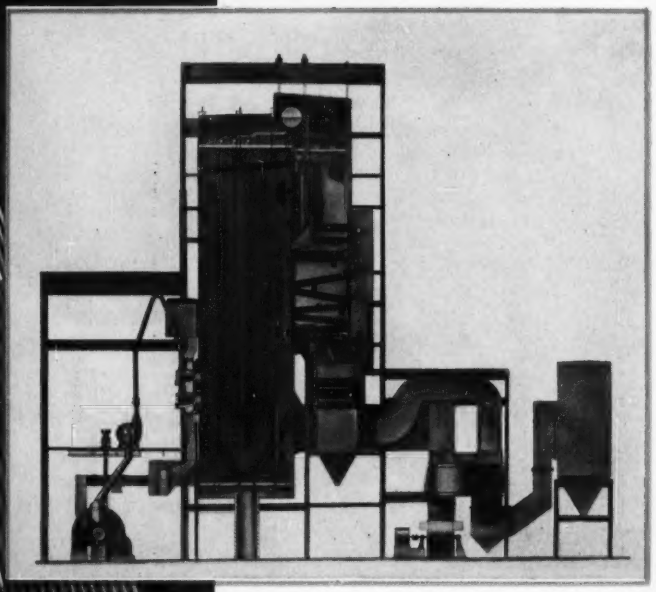
35 MADISON STREET • ST. LOUIS • MAIN 1-2821

Second "outdoor type" FW steam

LOW LOAD FACTOR

installed at new

Prefabricated at the job site, panel construction of furnace side-waterwalls, radiant superheater and division waterwall made possible significant savings in steam generator construction costs.



Cross-section of Martins Creek No. 2 steam generator, designed for continuous rated capacity of 1,200,000 lbs/hr at 1325 psig normal, 955F. Divided furnace, combination radiant and convection superheater, two continuous loop economizers, weatherproofed outdoor type.

generator, designed for

and QUICK START-UP

Martins Creek Steam Electric Station

Built for "below zero" winter conditions, No. 2 unit raises capability of this modern steam generating plant of Pennsylvania Power & Light Company to 320,000 kw.

UNLIKE most new steam generators that are installed for base load operation, with peak loads being carried on older, less efficient units, the new No. 2 Foster Wheeler steam generator at Martins Creek is intended at the beginning to operate at only 20 to 40 per cent capacity.

Like the No. 1 FW steam generator at this station, it is a peak load unit. It has the requisite control facilities so that it quickly can help meet the early morning demand present in the PP&L system. For these heavy load periods, it provides the desired additional capacity economically, at minimum total annual cost — the major portion of the power being provided by other stations of the system where the delivered fuel cost is appreciably lower.

The eleventh FW unit now serving the Pennsylvania Power & Light Company, this Martins Creek steam generator has an 8-hour-peak capacity of 1,300,000 lbs/hr at 1325 psig, 955F at the superheater outlet. Final steam temperature is held constant at all loads from 325,000 lb per hr to full load. Of the single drum, nonreheat type, it supplies steam to a turbine generator with a nameplate rating of 132,500 kw. Two Foster Wheeler ball mill pulverizers furnish bituminous coal to twelve 30-inch FW intervane burners.

View looking south showing Pennsylvania Power & Light Company's new Martins Creek Steam Electric Station.

Backed by more than 50 years' experience in power plant equipment pioneering, steam generators by Foster Wheeler assure efficient, dependable performance at low overall cost. Whatever your requirements, it will pay you to consult us. *Foster Wheeler Corporation, 165 Broadway, New York 6, N. Y.*

FOSTER WHEELER

NEW YORK • LONDON • PARIS • ST. CATHARINES, ONT.

MORE CAPACITY

Chase® Bus Conductors carry 20% more load!

Those ventilating holes in Chase Ventilated Square Tube Copper Bus Conductor help dissipate heat... and increase current-carrying capacity up to *20%*. And ventilated square tube bus conductor can *also* save you as much as *36%* in weight of copper as compared to flat rectangular bus bars!

Because of its rugged, square cross section configuration, Chase Bus Conductor is much stronger. It withstands the tremendous stress of heavy short circuits, permits longer spans between supports.

For more information, send for the free Chase Bus Conductor brochure.

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass, Copper & Stainless Steel

Atlanta	Chicago	Denver	Indianapolis	Minneapolis	Philadelphia
Baltimore	Cincinnati	Detroit	Kansas City, Mo.	Newark	Pittsburgh
Boston	Cleveland	Grand Rapids	Los Angeles	New Orleans	Providence
Charlotte	Dallas	Houston	Milwaukee	New York	Rochester
St. Louis	San Francisco	Seattle	Waterbury		

Get life-of-turbine guarantee for turbine oil just as Blackwell, Oklahoma light plant does—

Use NONPAREIL Turbine Oil

Five NONPAREIL Turbine Oil guarantee certificates hang on the wall of the light plant at Blackwell, Oklahoma, one for each turbine in the plant. They show that the turbine oil is guaranteed, for the life of the turbines, not to exceed a neutralization number of 0.15 mg. KOH/gm.

One of the guarantees is for the oil installed in a turbine in 1937. Up to then, the Blackwell Light Plant management had experienced trouble with turbine oil. Oil had to be changed and "rested". Separate batches of oil as well as cleaning oils had to be kept on hand. In June of 1937 the turbine was changed over to NONPAREIL Turbine Oil. As other turbines were added in 1939, 1942 and 1951, their initial fills were NONPAREIL.

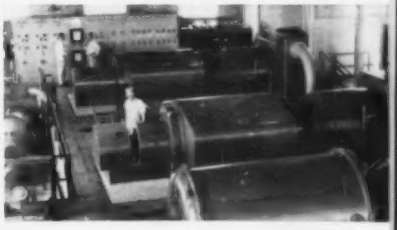
The five guarantee certificates on the plant wall are reminders to management that their decision to use NONPAREIL Turbine Oil was a good one. Since NONPAREIL went into the first turbine in 1937, the oil has *never* been treated in any way. Oil lines and system remain clean. Neutralization number of the oil in all five turbines has remained far below 0.15 mg. KOH/gm. In most cases it has ranged near 0.03 mg. KOH/gm.

Look into the possibility of using NONPAREIL Turbine Oil in your turbines. Call for additional information from your Standard Oil industrial lubrication specialist. There is one near you in any of the 15 Midwest and Rocky Mountain states. Or write Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.

J. V. Kincheloe (right) Blackwell light plant superintendent and Standard Oil lubrication specialist John Thornquist view NONPAREIL Turbine Oil guarantee certificates. John Thornquist is well qualified to assist industrial customers with lubrication problems just as he has done at the Blackwell plant. He has been doing this sort of work at Standard for 19 years. In addition, John is an engineer with a degree from the University of Minnesota and a graduate of the Standard Oil Sales Engineering School.

Turbine Oil Record Blackwell Municipal Light Plant

Type Turbine	Size—KW	Date NONPAREIL Installed	Capacity gal.	Range of Neut. No. (mg. KOH/gm.)
Westinghouse	2,500	June, 1937	173	.03 to .06
Westinghouse	4,000	April, 1939	150	.04 to .05
Westinghouse	1,500	January, 1942	75	.02 to .05
Westinghouse	4,000	May, 1951	325	.03
Westinghouse	4,000	May, 1951	325	.03

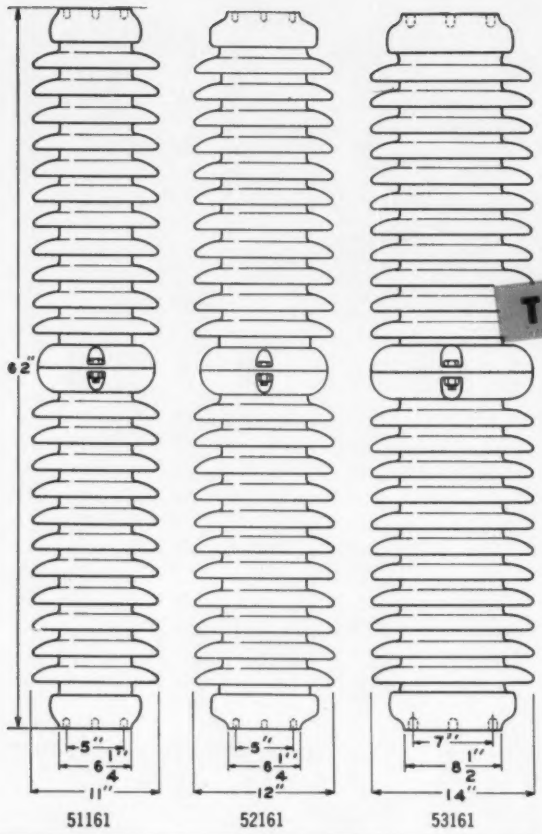


Turbine room of Blackwell, Oklahoma municipal light plant. NONPAREIL Turbine Oil is used in all five Westinghouse turbines.

STANDARD

STANDARD OIL COMPANY (Indiana)

NOW 161 kv Station



51161 52161 53161

Catalog Number	51161	52161	53161
Voltage Rating, kv	161	161	161
Cantilever Strength, lbs.	1,200	1,700	3,500
Tension Strength, lbs.	20,000	25,000	40,000
Torsion Strength, inch-lbs.	40,000	90,000	120,000
Compression Strength, lbs.	60,000	75,000	100,000
60-cycle Dry FO, kv	485	485	485
60-cycle Wet FO, kv	380	380	380
Impulse Flashover, kv Pos.	810	810	810
Impulse Flashover, kv Neg.	1020	1020	1020
60-cycle Withstand, kv Dry	385	385	385
60-cycle Withstand, kv Wet	315	315	315
Impulse Withstand, kv	750	750	750
Test Voltage, Radio Infl.	103	103	103
Maximum RIV, Microvolts	500	500	500
Leakage Distance, in.	132	132	132
Dry Arcing Distance, in.	51	51	51
Net Weight, lbs.	240	285	430

THE NEW LAPP DESIGN THAT'S MORE SECURE

Planning new station construction at 161 kv? Here's help to greater design flexibility . . . construction economy . . . and operating efficiency.

CHOICE OF STRENGTHS

Select the 1,200-lb. Standard Lapp Station Post, 1,700-lb. High-Strength, or 3,500-lb. Extra-High Strength unit on the basis of current and spacing requirements. In each strength rating, the Lapp Station Post unit meets NEMA and BIL values, and provides *extras* in convenience, economy and reliability.

EASIER, FASTER TO INSTALL

Two 31-inch-high units comprise each of these Lapp units . . . only one bolted connection is required for field assembly (as compared with four connections required to assemble the four stacking units and sub-base of the conventional pin-cap station insulator for this voltage).

The smaller over-all diameter of these units provides for greater flexibility in use, as well as reduced space requirements for storage and transportation.

Lighter weight, too, makes for easier handling; the new Lapp units weigh approximately 30% less than conventional units.

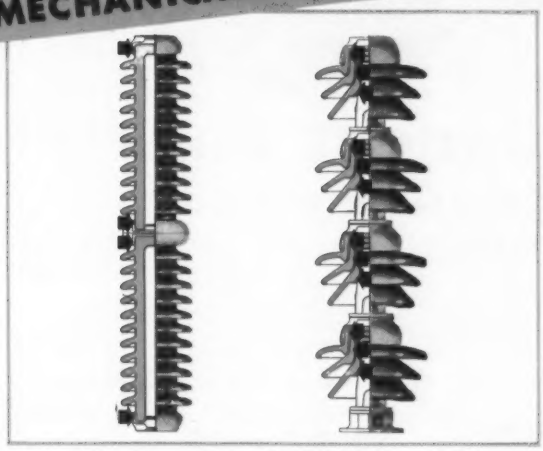
LAPP POSTS ARE STIFFER

Deflection under cantilever load results from "take-up" in bolted and cemented joints, and by flexing of metal parts. The Lapp Station Posts at 161 kv consist of two porcelain post sections, each with caps externally attached at the ends. This is a total of only *four* cemented joints, all of large-area low-intensity compression loading. This compares with the *twelve* cemented joints of the conventional 161 kv station insulator, each subjecting the assembly to relatively small-area, high-intensity tension loading.

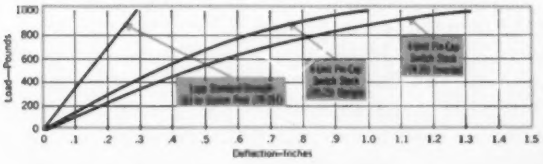
Posts in 3 Strength Ratings

EASIER TO INSTALL . . . EASIER TO MAINTAIN . . .

MECHANICALLY AND ELECTRICALLY



A comparison of rigidity characteristics of the two designs is shown in the deflection curves, as derived from laboratory measurement. The greater rigidity of the Lapp Post design provides an evident advantage in improved alignment between switch blade and contact—and in more positive switch operation. (The Lapp Posts preserve the advantage of stiffness at any mounting angle; for horizontal or inverted mounting applications, the superiority in rigidity is even more marked.)



MORE EFFECTIVE INSULATION

A higher ratio of porcelain-to-metal than in previous 161 kv designs results in increased flashover distance and more of the insulator height as effective insulation.

Lapp Fog-type design is the basic concept of all Lapp Posts. For service in contaminated atmosphere, its uniform leakage path, without narrow shielded hot-spots, reduces leakage flashover, and makes the insulator "self-cleaning" in wind and rain.

NO CRACKING . . . NO PUNCTURE

As in all Lapp Posts, the insulating value comes from porcelain posts, without internal metal components or nested parts. Porcelain is loaded only in compression, so avoids bursting tension forces. Puncture does not occur because external air path is as short as internal puncture path. Nor does corona form to create radio interference.

STURDY UNDER FLASHOVER OR IMPACT

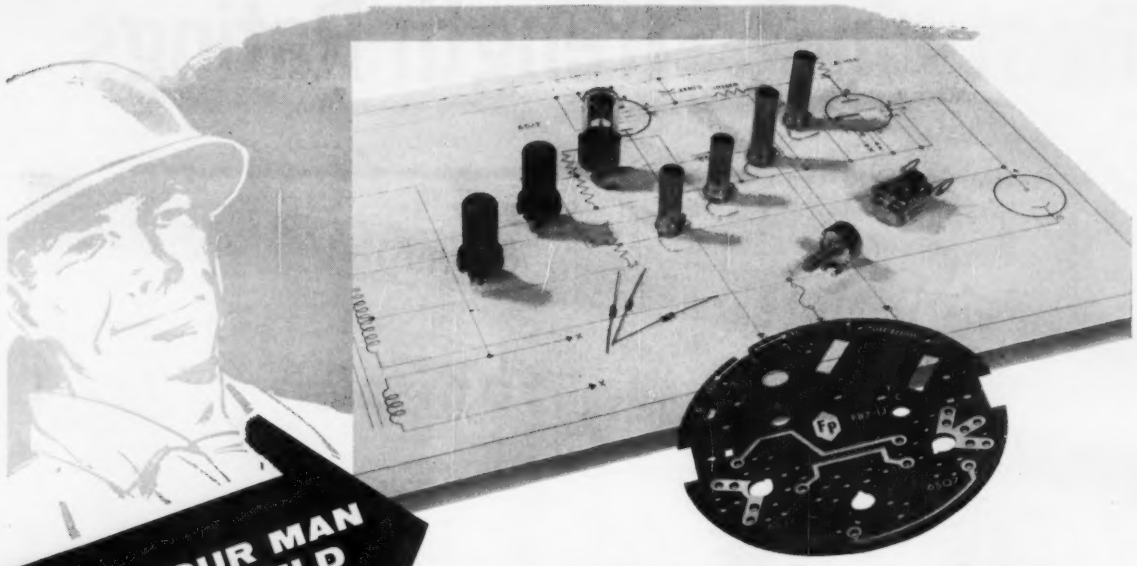
Leakage surface is achieved by multiple short petticoats, which in addition provide an exceptional protection to the insulator body under arcover or mechanical attack. Under extreme conditions, the petticoats themselves break off, leaving the post body intact, with only negligible loss of flashover or leakage value.

MODERN HIGH-VOLTAGE INSULATION

For 25 years, Lapp Station Posts have led the way to improved station performance and reliability. For the more exacting demands of the higher voltages being required on your system today, and in the future, Lapp Posts will provide an even greater margin of operating security.

Lapp Insulator Co., Inc., Le Roy, N. Y.

Lapp



ASK YOUR MAN IN THE FIELD ABOUT THE

component quality

OF FISHER-PIERCE

PHOTOELECTRIC LIGHTING CONTROLS

A look inside any Fisher-Pierce photoelectric lighting control immediately reveals a primary reason why they require extremely low maintenance and provide long-run economy: *component quality*. Here are specific examples: two *pre-aged* amplifier tubes, instead of one dual triode, for a guaranteed minimum life of 20,000 hours; *wire wound* potentiometer; *Sigma* sensitive relay for low plate current drain of power tube; *linen-based bakelite* sub-mounting chassis and etched circuitry; *metal encased* paper capacitors (no electrolytics); blue-sensitive 1P39 phototube with non-hygroscopic base. No other photoelectric control provides such consistently high component quality. Combined with this are these four other important features:

DESIGN ADVANTAGES — Can be installed, serviced or removed safely and easily • Wide mounting versatility and orientation *after* bracket installation.

PROTECTION — From surges and lightning, by linen-based bakelite sub-mounting chassis and proper component spacing Circuit and load fuses, and lightning arrestor • Fail-safe operation.

ADAPTABILITY — Three basic series and numerous models for all mounting requirements, operating voltages, load capacities and desired contact arrangements.

DEPENDABILITY — Proven by the thousands of F-P controls used by hundreds of utilities, over the past ten years.

Complete specifications and operating data are contained in informative F-P Bulletins, available on request. Or call the Fisher-Pierce sales representative in your area, for point-by-point proof of F-P superiority.

THE FISHER-PIERCE CO., INC.

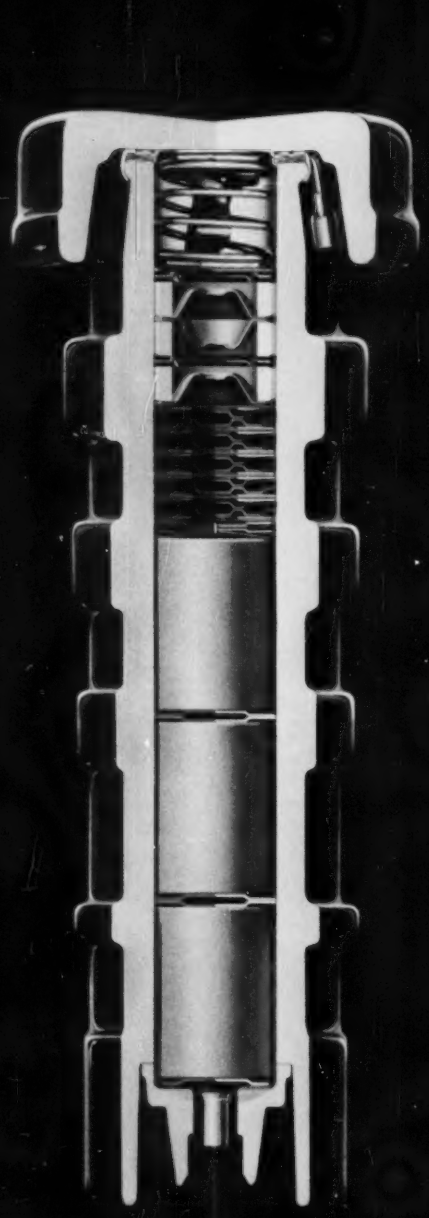
82 Pearl Street, So. Braintree, Boston 85, Mass.

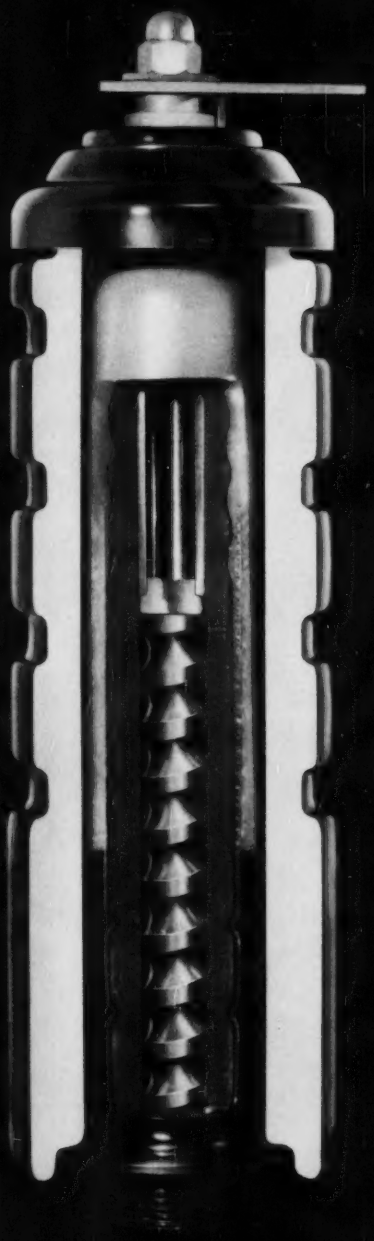
Valve or expulsion arresters?

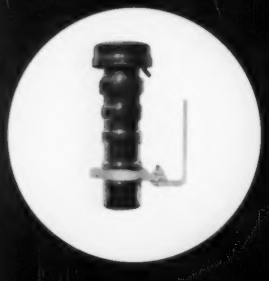
The two basic types cover all applications

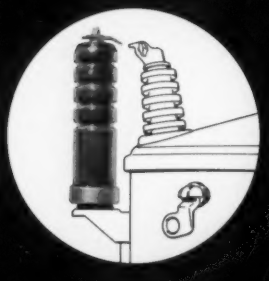
WATCH WESTINGHOUSE!

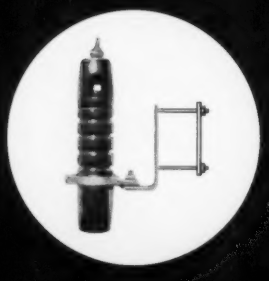
*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

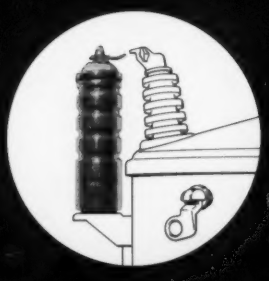












LV LVT LX LXT

VALVE EXPULSION

Valve or Expulsion...

Only Westinghouse is in the unique position of having a complete line of both types—each having outstanding performance.

There is *no real controversy* over valve versus expulsion arresters . . . *if* the basic design of both is sound.

Westinghouse was the originator of both types: Valve type invented by Dr. Slepian in 1922; expulsion, by Torok in 1933. Improvements by Westinghouse in both designs have been continuous, keeping pace with the "stiffening" requirements of distribution systems, until today both Westinghouse arresters are evaluated as providing equal lightning protection.

The following explains why . . .

LIFE . . .

Confused claims of superior life expectancy for either type are misleading. The life expectancy of a Westinghouse design, valve or expulsion, averages well beyond that of any transformer it may be installed on to protect. Field records on CSP® transformers indicate 26 million arrester years of service with less than .026% failure rate.

APPLICATION . . .

How close to a substation they may be installed is never a problem with either Westinghouse arrester. Autovalve® blocks have such inherent resistance at line-to-ground voltage that "follow current" is low in value. Westinghouse expulsion arresters likewise limit follow current to only a few hundred amperes. The unique spiral groove and molded jacket design provide the most effective current-limiting expulsion arrester available today.

DIRECT STROKES . . .

Both Westinghouse valve and expulsion arresters not only meet the industry standards of 65,000 surge-amperes, but have been tested well in excess of this level. For example, 9-kv arresters, both types, have successfully discharged currents in excess of 100,000 amperes.

PROTECTIVE CHARACTERISTICS . . .

Impulse spark over is safely below the insulation level of the transformer protected. Yet the 60-cycle spark-over levels of both Westinghouse designs are high enough that harmless switching surges will not cause arrester operation. No other designs achieve this unique and exclusive balance . . . an engineering decision reached by Westinghouse, based on more years of arrester experience in the field than any other manufacturer.

FUSE COORDINATION . . .

Both Westinghouse valve and expulsion arresters limit follow current to less than a half cycle. Since coordination between transformer and sectionalizing fuses requires more than a half cycle, Westinghouse arresters do not enter into this problem.

SERVICE RECORD . . .

Westinghouse, with more arresters in service today than any other manufacturer . . . of both types . . . computes a better than 99.974% perfect service record.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Westinghouse recommends

expulsion (LX-T) arresters for CSP transformers

because . . .

APPLICATION

The arrester application problems such as: spark-over voltage, surge-current ability, discharge voltage, 60-cycle short-circuit capacity and arrester life become the primary responsibility of the manufacturer when a coordinated CSP packaged unit is purchased. The Westinghouse expulsion arrester has all the desirable characteristics which are needed to protect the transformer and the system.

FIELD RECORD

Since the introduction of the CSP transformer, over 1.5 million Westinghouse CSP's with expulsion arresters have been installed. The field record of these units indicates over 26 million arrester years of service with a failure rate of less than .026%.

STANDARDIZATION

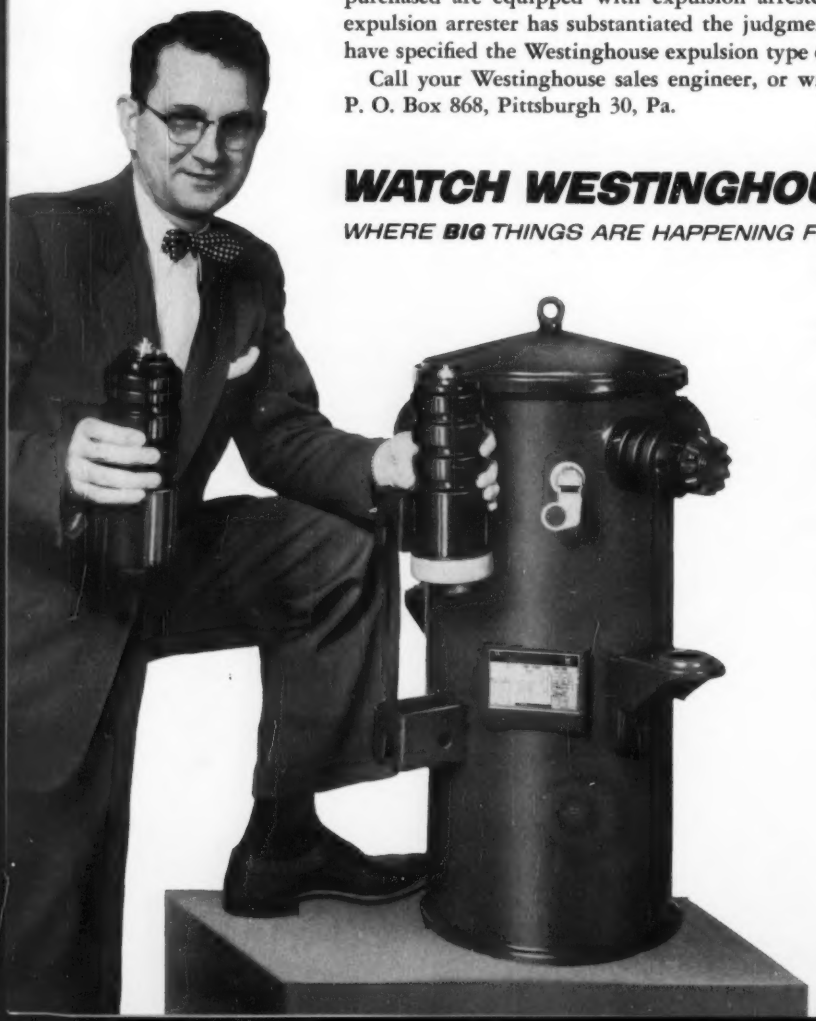
It makes sense to standardize on an arrester with proved superior performance — to help utilities reduce ordering problems and improve service through this standardization.

Today after 23 years of experience, 97% of Westinghouse CSP transformers purchased are equipped with expulsion arresters. The compiled record of the expulsion arrester has substantiated the judgment of those utility engineers who have specified the Westinghouse expulsion type on CSP's.

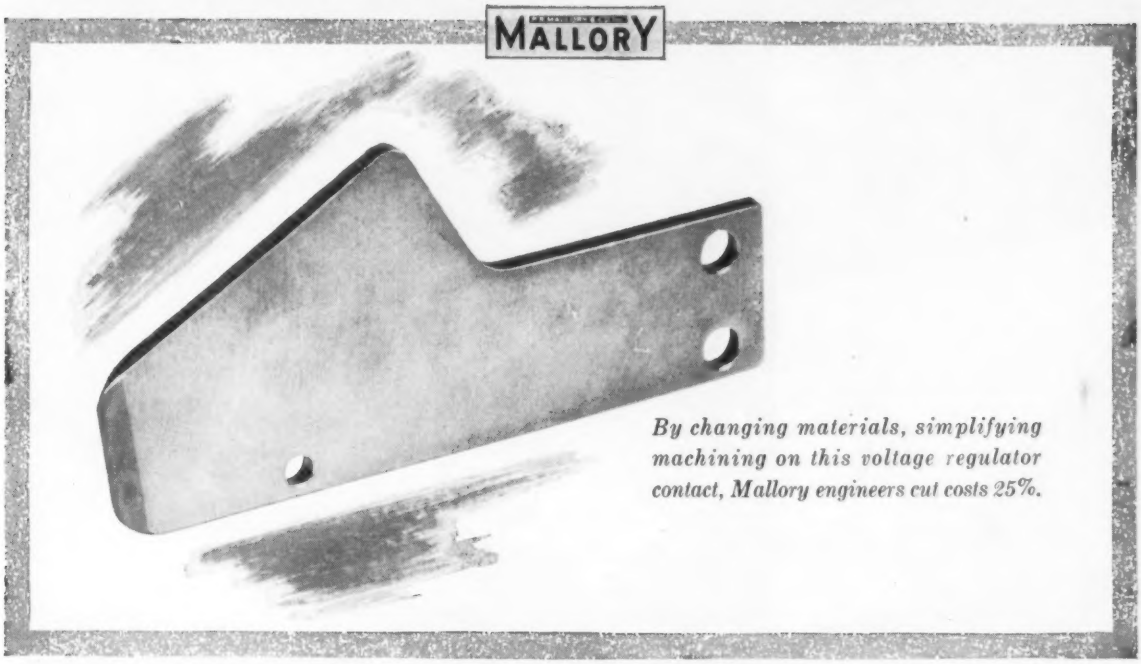
Call your Westinghouse sales engineer, or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. J-70771

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***



MALLORY



By changing materials, simplifying machining on this voltage regulator contact, Mallory engineers cut costs 25%.

Value Analysis by Mallory Saves Money on Contacts

Mallory Contact Engineering Offers Five Ways To Improve Economy

1. **The most effective contact material** from the extensive line developed by Mallory. More economical alloys often can satisfy *actual* service conditions.
2. **The most economical contact design . . .** for your purchasing, production and product needs.
3. **The most economical backing material** . . . from a group of Mallory alloys developed for this use.
4. **The most economical backing member design** in relation to contact and product design requirements.
5. **The most economical method of assembly** of contact and backing member.

By coordinating *all* these important elements of contact design, Mallory can help you put into effect a long-range plan for cutting contact cost and assuring peak performance.

BETTER not take electrical contacts for granted. There's much more to contact design than meets the eye. Often Mallory engineers can, through a detailed analysis of requirements, recommend changes that amount to real savings.

The contact shown here, for a substation transformer voltage regulator, illustrates how deeply Mallory engineering penetrates into contact design. First step after scrutinizing all aspects of the application, was to change the material to Mallory ELKALOY® A. *This change gave a more economical alloy to work with . . . at no sacrifice of performance for the intended use.* Then, Mallory specialists recommended simplifications in manufacturing. Instead of a double disc finishing operation, they used a rolled-finish product . . . with less waste, less cost. Also eliminated as unnecessary to the desired service were three complete operations: sanding of the entire edge of the piece, and counterboring of holes for hold-down bolts and buffing of the chamfered end.

The contact is now being manufactured under simplified specifications, free of unnecessary "frills"—and gives equal performance *at 25% less cost!*

This is the kind of thorough, cost-conscious engineering that Mallory can apply to your own electrical contact designs. Our extensive experience in contact alloys, contact design and contact assembly engineering is ready to serve you. Write or call Mallory for a consultation.

Expect more . . . get more from

P. R. MALLORY & CO. Inc.
MALLORY
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Serving Industry with These Products:

Electromechanical—Resistors • Switches • Tuning Devices • Vibrators
Electrochemical—Capacitors • Rectifiers • Mercury Batteries
Metallurgical—Contacts • Special Metals • Welding Materials

The earliest Greeks used the "inextinguishable flame," as they called asbestos, for lamp wicks . . . the first record of the practical incombustibility of this historic mineral fiber.

Today, asbestos assists man in thousands of ways in modern living. For example non-ferrous K&M Asbestos tapes, like these illustrated, are relied upon for electrical insulation where voltages and temperatures are extremely high.

K&M ASBESTOS TEXTILES

insulate . . . protect from fire . . . are practically indestructible!

As ancient as writing . . . as modern as atomic energy, asbestos has unique qualities that have made it of constant use to man. And even today there is no substitute for the combination of characteristics it offers to industry.

Woven into cloth, tape or thread it makes superior electrical insulation . . . protects from heat and chemicals and retains its strength through a wide range of temperature and humidity conditions. And asbestos is immune to rot and corrosion, as well.

K&M Asbestos Textiles are made only from carefully selected grades of asbestos fibers to assure maximum uniformity and reliability. They're backed by more than half a century of imaginative research and development experience.

Investigate K&M Asbestos Textiles for any insulating problem you may have. Write or call us any time.

KEASBEY & MATTISON COMPANY • AMBLER • PENNSYLVANIA

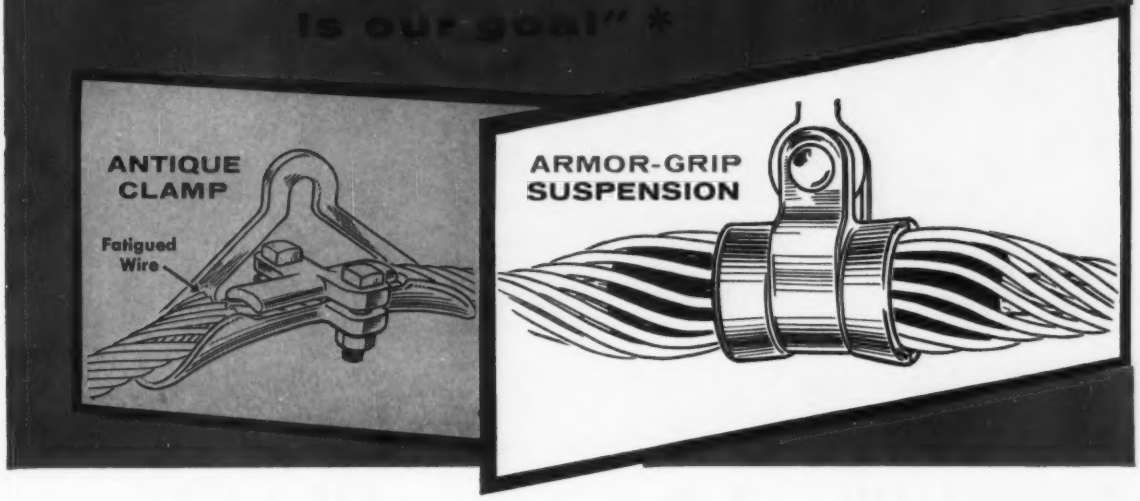
K&M best in asbestos ®

IN CANADA: ATLAS ASBESTOS COMPANY, LIMITED; MONTREAL, TORONTO, WINNIPEG, EDMONTON AND VANCOUVER

"PERFECTING

not PERFECTION

is our goal" *



"they both suspend the conductor, BUT . . ."

. . . *yesterday's answers* are not good enough. Today's will need improving tomorrow.

Take the problem of vibration fatigue. Failure of strand because of vibration or galloping does not occur in mid span. But it becomes a real problem at points of stress concentration, such as the end of the clamp keeper—at mass concentrations, such as at clamps, dampers and rigid splices—or at wearing points at loose attachments or fastenings.

Yesterday's answer—Preformed Armor Rods, introduced by Preformed Line Products Company in 1947.

Today's answer—PLP Preformed Armor with pitch direction the same as conductor strand and pitch length less than that of strand (Patent No. 2,609,653). When used in conventional clamps:

- it extends uninterrupted conductor life
- it eliminates wear possibilities
- it prevents excessive mass and stress concentrations

Tomorrow's answer is here today: the Preformed armor rod principle carried one step further in Preformed's ARMOR-GRIP SUSPENSION (Patent No. 2,722,393), the entirely new concept in suspension design.

The Armor-Grip Suspension Unit is a "floating suspension"—the conductor is cradled in neoprene and firmly gripped only by the custom-designed Preformed Rods which distribute their pressure over a relatively large area. The result: no wear possibilities—no mass concentrations—*and no clamping stress concentrations.*

This is another example of PLP research laboratories at work. Ever improving methods, materials and solutions is our goal. Call a PLP Representative today and ask for a demonstration.

* *John Dewey, "The Reconstruction of Philosophy"*

Made in accordance with or for use under one or more of the following U. S. Patents: 2,722,393; 2,275,019; 2,587,521; 2,609,653; 2,691,865; other patents pending.

PLP

PREFORMED LINE PRODUCTS COMPANY

5349 ST. CLAIR AVENUE · CLEVELAND 3, OHIO

TELEPHONE: CLEVELAND EXPRESS 1-3371

Transportation. The 4-Wheel-Drive 'Jeep' Truck's go-anywhere ability takes crews and equipment to meet service emergencies, over good roads or no roads, in good or bad weather—along the right-of-way or to off-road structures where other vehicles can't go.

Only 4-Wheel-Drive 'Jeep' Vehicles meet every service emergency!

Trenching. The 'Jeep'-propelled trencher digs up to 800 feet of clean-cut trench per hour, to speed the installation of cable, conduit and service lines. Travels safely on the highway at top legal speeds between jobs.

Maintenance. With the extra traction of its 4-wheel drive, the versatile Universal 'Jeep' gets through to trouble spots, on the road or off, with sure dependability. It helps speed installations, keeps service and maintenance schedules up-to-date.

Whether carrying an underground detail with cable splicing equipment or helping work crews string high wire, 'Jeep' vehicles work 'round-the-clock in electrical industry service.

Time-tested, performance-proved go-anywhere 'Jeep' transportation virtually assures uninterrupted customer service. In emergencies, the extra traction of 4-Wheel-Drive 'Jeep' Vehicles carries men, tools and equipment through mud, sand, soft earth or up steep grades—in heavy rain, snow or other emergencies of weather—to reach tower, substation, service lines or wherever repairs are needed. On the highway, 'Jeep' vehicles travel in conventional 2-wheel drive at top legal speeds.

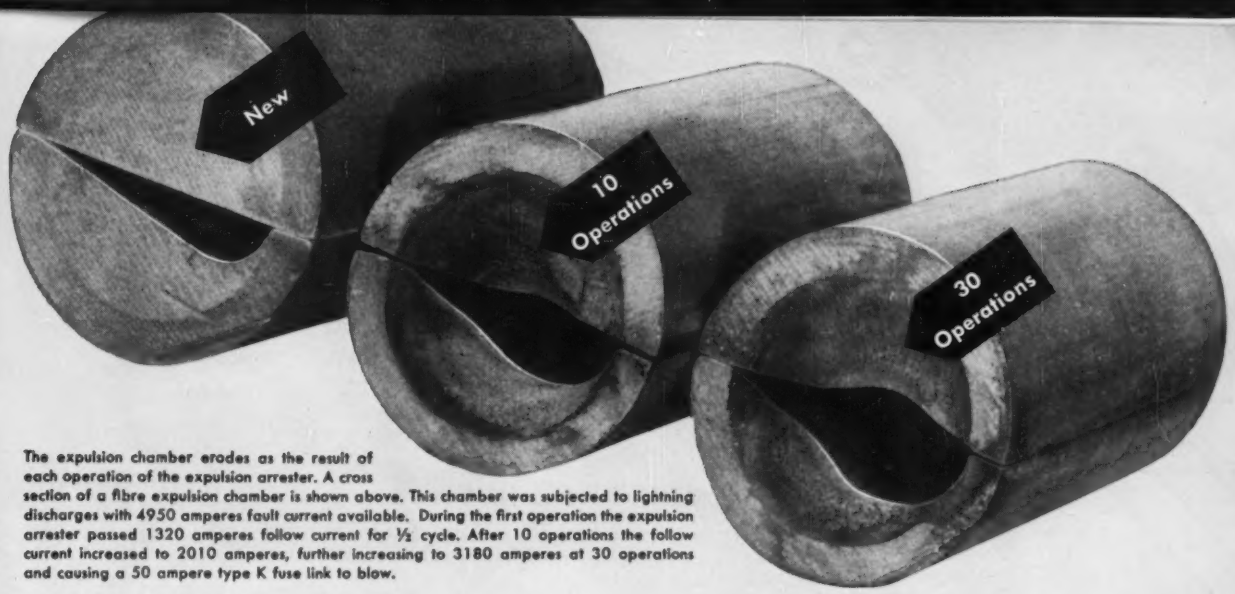
For hundreds of different jobs, from installing meters to patrolling the right-of-way, rugged 'Jeep' vehicles serve the electrical industry. Ask your Willys dealer for a practical on-the-job demonstration today, or write for information.

The 'Jeep'®

family of 4-Wheel-Drive Vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO



The expulsion chamber erodes as the result of each operation of the expulsion arrester. A cross section of a fibre expulsion chamber is shown above. This chamber was subjected to lightning discharges with 4950 amperes fault current available. During the first operation the expulsion arrester passed 1320 amperes follow current for ½ cycle. After 10 operations the follow current increased to 2010 amperes, further increasing to 3180 amperes at 30 operations and causing a 50 ampere type K fuse link to blow.

Why Valve Type Lightning Arresters Last Longer Than Expulsion Arresters

Valve arresters are unaffected in handling lightning discharges usually encountered in service. The fibre used in expulsion arresters is affected by both atmospheric conditions and erosion; life of the arrester is reduced.

by **HERMAN O. STOELTING**
Special Assignments Engineer
Line Material Company

Compare the basic difference in construction and operation of valve and expulsion arresters and you will see why we at L-M say that *valve arresters are better than expulsion arresters.*

Construction and Operation of Valve Arresters

The valve arrester operates on the principle of a valve. It "opens" with low resistance to high-voltage, high-current lightning surges, and "closes" by offering high resistance to power follow current.

The valve arrester is chemically inert. It is electrically and mechanically unaffected by lightning discharges usually encountered in service.

Construction and Operation of Expulsion Arresters

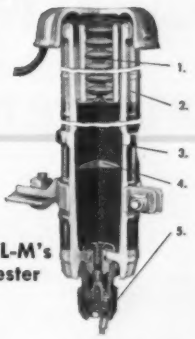
The expulsion arrester, operating on the pressure principle, utilizes fibre to generate gases which expel the arc. Each time the arrester operates, fibre is eroded. Eventually, insufficient pressure is generated within the enlarged bore to extinguish the arc. Operation of a sectionalizing device is then required to clear the fault.

Upper and Lower Limits

The valve arrester is designed to extinguish 60-cycle follow current quickly and dependably, regardless of the follow current available. The valve arrester gaps are pre-set and permanently sealed; they cannot get out of adjustment.

The expulsion arrester, however, has an upper and possibly a lower limit for the magnitude of fault currents. If the arrester is subjected to a high 60-cycle follow current, it may explode. If the 60-cycle follow current is too low, the expulsion arrester may fail to extinguish the arc.

The expulsion arrester failure problem is further complicated, because the lineman cannot tell by inspection in the field if the arrester is failing to clear the arc. Trouble-men may spend hours and drive miles looking for the cause of intermittent trouble . . . and find nothing.



Features of L-M's Valve Arrester

1. The ladder spark gap is designed to provide a perfect balance between 60-cycle sparkover and impulse sparkover.

2. The Pyrex glass housing permits visual inspection to detect mechanical or electrical damage.

3. "Granulon," the valve material, is able to withstand severe heating which accompanies heavy strokes of lightning.

4. Lens-shaped electrodes in the element compensate for "skin effect," assuring uniform distribution of surge current throughout the valve element.

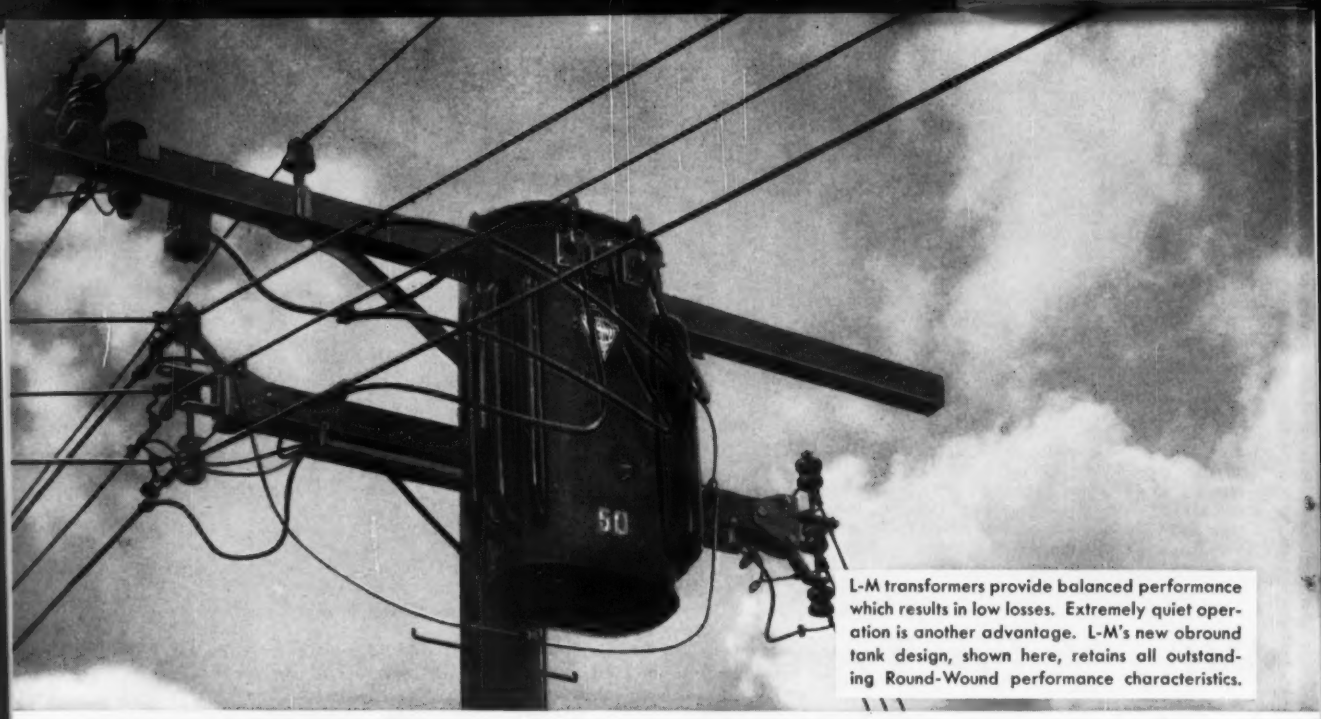
5. L-M's exclusive "Isolator" gives positive assurance against grounding feeders by instantly disconnecting the ground lead from the arrester if the arrester should ever become damaged.

Get Complete Information—Details of some of the extensive evidence in favor of valve over expulsion arresters are given in a new booklet, "The Theoretical and Practical Aspects of Lightning Protection on Distribution Systems". Whichever type you use, we believe you'll be interested in this report. Ask your L-M Field Engineer for a copy or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

262

LINE MATERIAL Lightning Arresters

A McGRAW ELECTRIC COMPANY DIVISION



L-M transformers provide balanced performance which results in low losses. Extremely quiet operation is another advantage. L-M's new obround tank design, shown here, retains all outstanding Round-Wound performance characteristics.

How L-M's Round-Wound® Design Assures Consistently Low Losses, Greater Revenue

L-M's wound-core, round-coil construction provides the most efficient design for low losses, good regulation, greater revenue at all power factors.

By **R. W. HARTSOOK**
Chief Engineer
Small Distribution
Transformers
Line Material Company

One of the most important objectives in transformer design is to achieve a balance of low copper loss, low exciting current, and low core loss without sacrificing other desirable performance characteristics. The Round-Wound design has many inherent advantages that aid the designer in achieving this objective.

Round-Wound Design Offers Balanced Performance

L-M's Round-Wound transformer design consists of a wound core, with a cruciform cross section closely approximating a round form. Long round coils are wound directly onto the wound core. This construction gives L-M transformers inherent advantages to minimize losses and offer balanced performance.

Low Copper Loss

In the Round-Wound transformer, the core cross section is nearly round. As shown in Figure 4 at right, a round core has a much smaller perimeter than a rectangular core of the same cross-sectional area. Therefore the turns in a Round-Wound coil are shorter. (Figs. 2 and 3). With the same cross-section wire and the same number of turns, there is less total length of wire and less watts of copper loss.

In addition, the higher efficiency of the core-coil arrangement actually permits fewer turns. The combination of smaller turn diameters and fewer turns results in low reactance and impedance, giving the desirable regulation indicated by the curves in Figure 1.

High Overload Capacity

Low copper loss also contributes to better overload capacity, since copper loss watts increase as the square of the overload on a transformer. Therefore any reduction in copper loss results in a substantial increase in overload capacity. This is a bonus over the excellent overload capacity of the Round-Wound transformer resulting from its exceptionally good cooling characteristics.

Low Exciting Current, Low Core Loss

L-M's core is tightly wound of a continuous strip of oriented steel. Coils are wound directly onto this core by means of L-M's exclusive winding machine. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This construction results in low exciting current and high magnetic efficiency of the core.

Quiet Operation

L-M's wound-core construction eliminates all laps, flaps and gaps in the laminations. This contributes greatly to the extremely quiet operation of L-M's Round-Wound transformer.

Get Details on L-M's Round-Wound Transformers

Ask the L-M Field Engineer for complete information on L-M's Round-Wound design, and bulletins. Or write Line Material Company, Transformer Division, Zanesville, Ohio.

LINE MATERIAL
A McGRAW ELECTRIC COMPANY DIVISION

L-M's wound-core, round-coil construction provides exceptionally good cooling for high overload capacity and almost an ideal magnetic circuit to minimize losses.

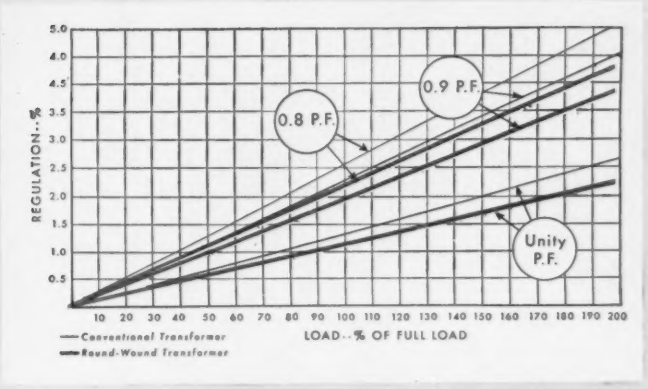


Fig. 1. Round-Wound offers good regulation at all power factors. Regulation of new 25 kva 2400-120/240 volt Round-Wound transformer compared with that of older design, showing effect of load and power factor on regulation. Multiply the difference in regulation by the number of old distribution transformers on your system, and see how much more revenue these modern L-M transformers produce.

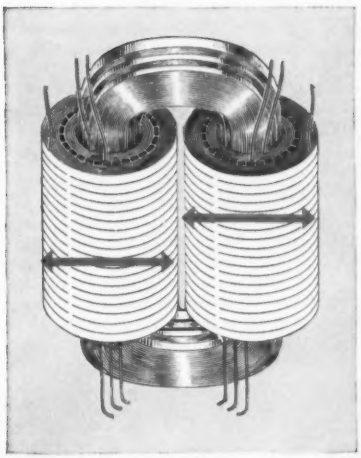


Figure 2. Round-Wound Design

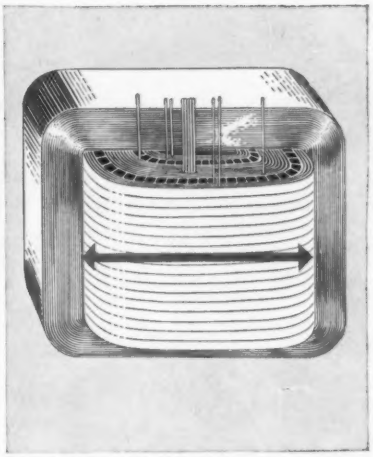


Figure 3. Shell-Type Design

Compare the difference in mean-turn diameter. L-M's Round-Wound design with the long round coils has a lower mean-turn diameter than a shell-type design. This contributes to L-M's low losses, which in turn result in good regulation, greater revenue at all power factors.

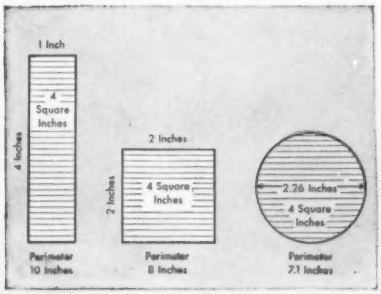
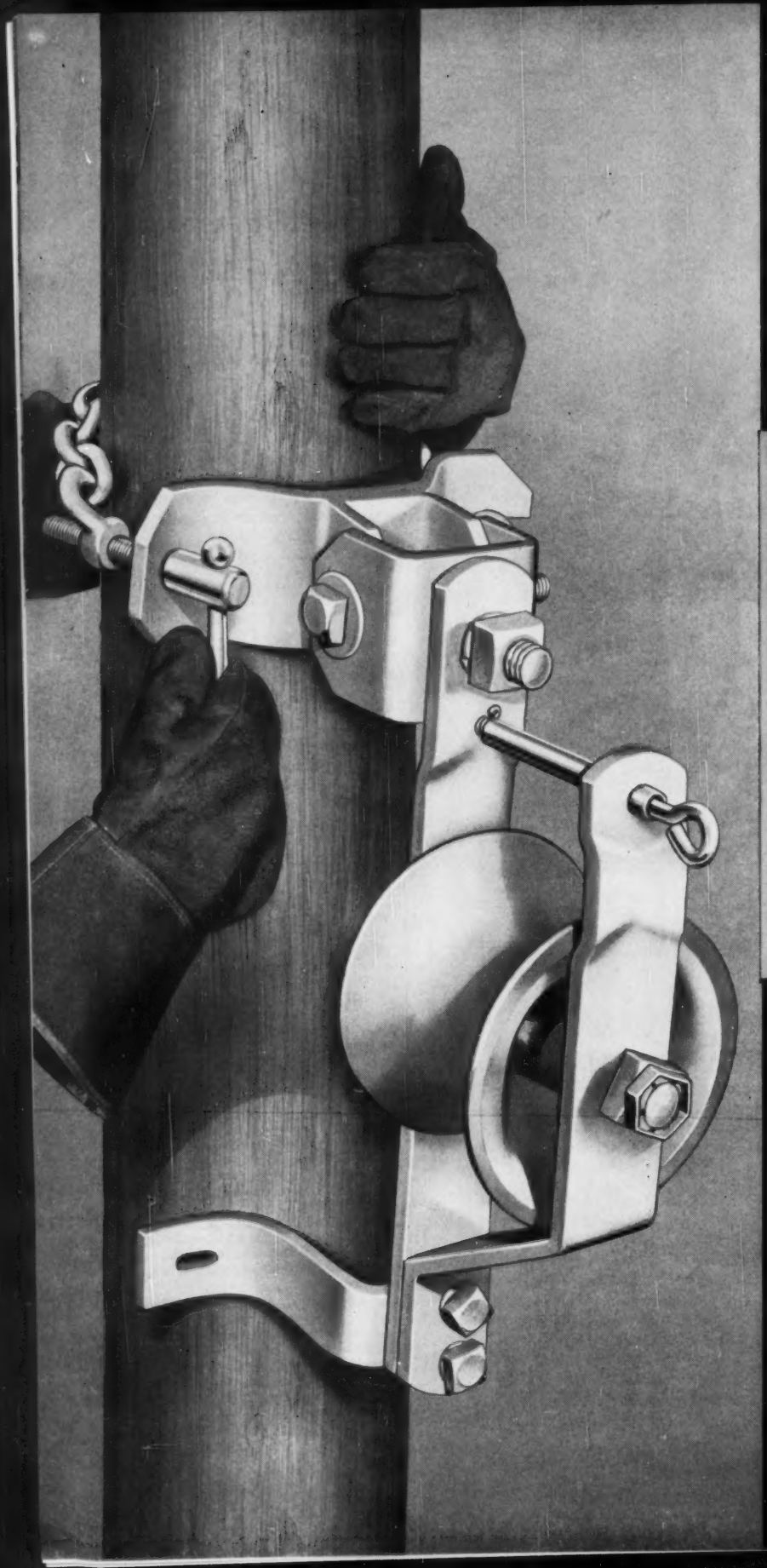


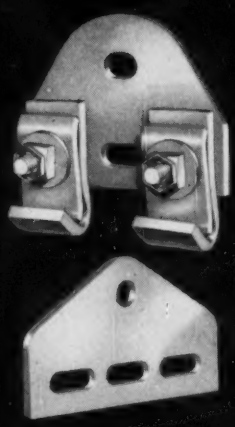
Figure 4. Compare the difference in perimeter. Each of these core cross sections has an area of 4 square inches. It takes only 7.1" of wire to make a turn around the core of round cross section typical of L-M transformers. This results in better utilization of copper, lower copper loss.

Five Reasons Why More Customers Are Selecting L-M Round-Wound Transformers

1. **Higher Uniform Impulse Level:** Round coils are *wound* into shape. Therefore insulation is not damaged by malleting into rectangular shape. Coils have longer creepage distance between windings and between leads.
2. **Higher Short-Circuit Strength:** Round coils are not stressed out of shape under high radial short-circuit forces. Strong steel frame, heavy clamping bolts, sturdy maple blocks and varnished coils prevent axial movement.
3. **Higher Short-Time Overload Capacity:** Round coils and the cruciform cross-section core expose large surfaces to cooling oil. The result is relatively low hot-spot temperatures, which add considerably to high short-time overload capacity.
4. **Balanced Performance:** The core is a continuous wound strip of oriented steel. Coils are wound directly onto this core. Since the core is not cut, unwound, or disturbed in any way after annealing, there are no air gaps to break up the flux path. This results in low exciting current and core loss.

   The wound-core, round-coil design permits fewer winding turns and smaller turn diameter. This results in low impedance, and provides better regulation at all power factors.
5. **Additional Capacity on Pole:** L-M's new obround tank design makes the unit smaller and lighter, with shorter moment arm from the pole. This combination reduces the bending moment on the pole and crossarms, and thus greatly increases the potential capacity of existing transformer structures.

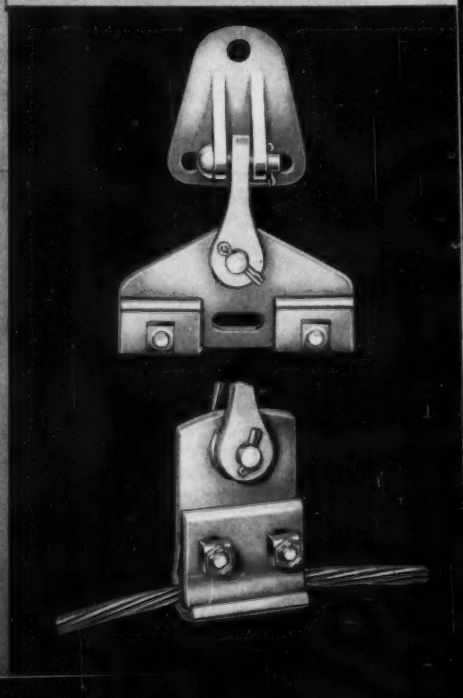


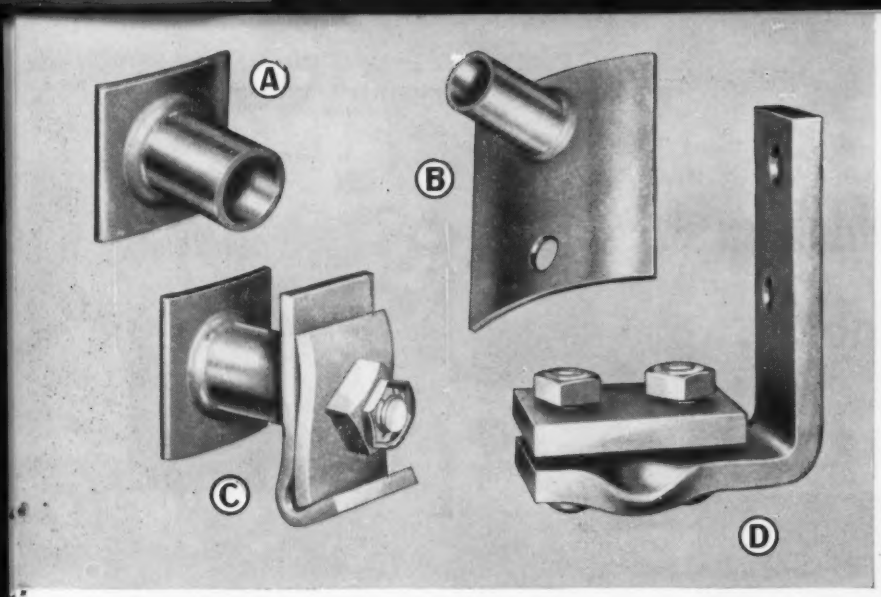


DOUBLE SUSPENSION HANGER clamps the messenger and may be used during stringing without tightening the clamps. The lower plate takes two or three one-bolt clamps. May be mounted as a unit with a machine bolt and washer spacer, or hung on the swinging bracket.

HINGED STRINGING PULLEY needed at each pole for economical, safe installation of aerial cable without damage to conductor insulation. Used on both tangents and angles, mounted just below the permanent messenger clamps, and removed after line is strung. Hinged joint between pulley yoke and pole frame permits pulley to swing out, keeping cable in the groove.

DOUBLE-SWING SUSPENSION BRACKETS made by combining standard parts. Below is the complete bracket; bottom illustration shows another type of hanger that may be substituted. Meets unusually severe conditions, where a free-floating bracket is needed. Assists in equalizing stresses on cable. Malleable pole plate is curved, to give extra rigid support; mounted with one machine bolt and two lag screws.

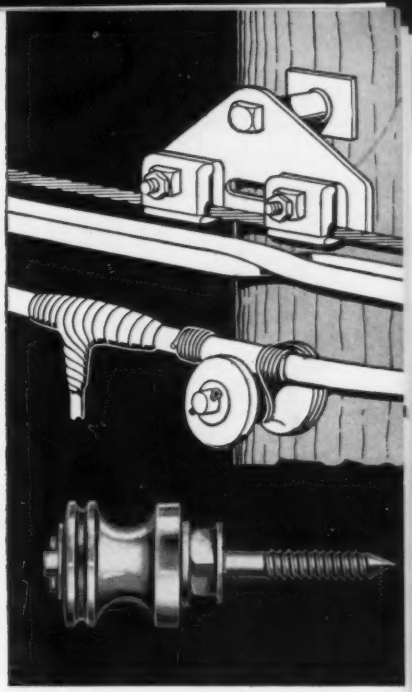




WASHER SPACERS used where standard machine bolts are used to mount messenger clamps. These spacers provide good bearing on the pole and keep cable from rubbing against the wood. Top left (A) is Flat Washer Spacer; at right (B) is Curved Plate Spacer for heavier cables, or longer spans; lag screw in lower hole keeps machine bolt from ovalizing hole in pole.

ONE-BOLT HANGER (C) shown with small washer spacer, used for small aerial cables such as street lighting and secondary cable. Rounded groove, flared edge. For ½" or ⅝" bolt.

UNIVERSAL MESSENGER HANGER (D) used for smaller size cable or where minimum clearance between cable and pole is required. Rounded groove has widely flared edges to prevent nicking the strand as well as to permit using this hanger on small angles as well as tangents. Forged open-hearth steel, hot-dip galvanized. Widths from pole 3⅞" and 4 3/16", and 4⅞" high, with offset holes for ⅝" machine bolt and ½" lag screw. Two ½" track bolts. For messenger from ¼" to 9/16".



INSULATED LAG SCREW BRACKET used to support the phase conductor where the conductor has been taken out of assembly—for example, when making a transformer tap. Standard ½" x 3" gimlet lag screw, with head and extension for a 3" dry or wet process spool insulator.

L-M Offers Service-Tested Materials To Simplify Aerial Cable Construction

DOUBLE UPSET EXTENSION BOLT provides, in one piece, a mounting bolt, spacer for pole clearance, and extension for mounting clamps. Eliminates stocking and assembly of separate parts, and thus saves more in time than it costs. Strong hexagonal section provides wrench hold. One-piece mild steel forging, ⅝" diameter, 6 to 18" long plus 4-inch extension.

To meet the special requirements of aerial power cable, Line Material some years ago began to study the needs for construction materials. The engineers, working alongside of the utility company specialists, soon found that standard pole line hardware was seldom completely satisfactory. And so a program of designing and testing special hardware was instituted. This program has continued, and as new requirements appear, new items are developed and tested.

L-M aerial cable construction materials are designed for maximum utility and interchangeability. These items can be fitted together in a variety of combinations to serve a number of purposes. The result is that with L-M aerial cable construction materials, you can solve almost any construction problem, regular or special, that may be encountered.

For help on any problem

Ask the L-M Field Engineer for information on the complete line of L-M aerial cable hardware, and a copy of Bulletin AC1; or write Line Material Company, Milwaukee 1, Wisconsin. In Canada: Canadian Line Materials, Ltd., Toronto 13, Ontario.

102-R

LINE MATERIAL

A McGRAW ELECTRIC COMPANY DIVISION

LM

Line Construction Materials

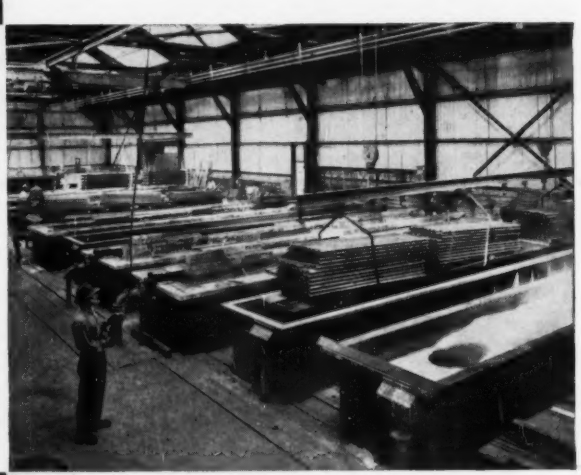
When Bethlehem gets the job . . .

SKILLED ENGINEERS plan production of your towers and switchyard structures. Their detail drawings assure accurate, efficient fabricating. They tell our shopmen exactly where to punch and shear . . . to within 1/32 inch! Takes good men and good tools to do this kind of job.

RACK PUNCHES (shown here) as well as tandem and cluster punches are among the *specialized* equipment necessary. Holes must be accurate in position and size—they can't be reamed after galvanizing. There's all the difference in the world between tower work and ordinary structural fabricating.

GALVANIZING protects the steel from corrosion. The pieces are thoroughly cleaned, pickled, immersed in an electrically controlled zinc bath, then quenched. We do our own galvanizing, of course. All three Bethlehem tower shops are equipped with the latest word in galvanizing facilities.

FINISHED STEEL is carefully sorted in the shipping yards. You receive each individual tower "package," including fasteners, ready for speedy erection in the field. Our tower-fabricating works at Leetsdale, Pa. (near Pittsburgh), South San Francisco, Calif., and Seattle, Wash. are strategically located to fill your tower and switchyard requirements. May we quote on your next job? Please contact the Bethlehem sales office nearest you.



BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.
BETHLEHEM PACIFIC COAST STEEL CORPORATION, SAN FRANCISCO
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

Built on an Unassailable Foundation

PACIFIC®
BOILER FEED PUMPS

PARTS EITHER CIRCULAR OR CYLINDRICAL

CARE AND PRECISION DURING MANUFACTURE & ASSEMBLY

UNITIZED INTERNAL ASSEMBLY AMPLY SUPPORTED • FREE TO EXPAND

PRECISION BALANCING FREE FROM VIBRATION IN OPERATION

EXPANDS WITHOUT DESTROYING ALIGNMENT OR CLEARANCE BETWEEN PARTS

DESIGN CLEARANCES STAY PUT CONTINUOUS SMOOTH OPERATION

RING TYPE PRESSURE JOINTS
METAL-TO-METAL POSITIVE SEAL | SEALED TIGHT—NOT OPENED BY INTERNAL PRESSURE

HIGH EFFICIENCY LONG USE LIFE • MINIMUM MAINTENANCE

GOOD ENGINEERING AND DESIGN SUPREME QUALITY MATERIALS

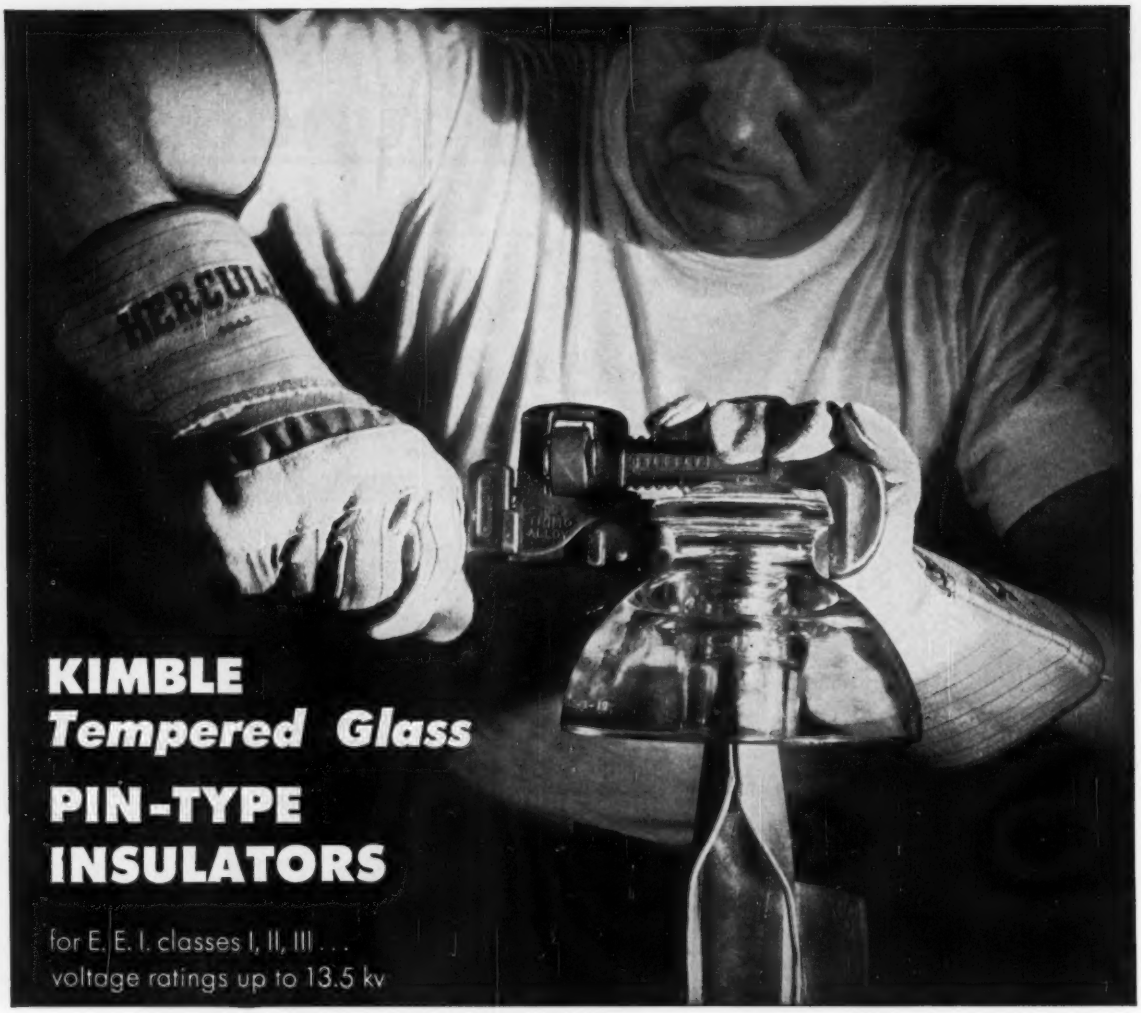
CAREFUL, PRECISE WORKMANSHIP

For complete information on Pacific Boiler Feed Pumps Write for Bulletin 122.

PACIFIC®

PACIFIC PUMPS INC.
HUNTINGTON PARK, CALIFORNIA
Offices in All Principal cities
Export Office: Chanin Bldg., 122 E. 42nd St., New York

BF-23



Stronger than the pin that supports it

SO STRONG . . . Torque test shows strength sufficient to strip threads on lead bushed pins and actually twist pole top steel pins.

This great strength saves installation time. It is not necessary to loosen Kimble tempered insulators for line-up with the conductor. Their strength will always allow another quarter-turn.

If it's on the pin, it's in service
In the event of shattering due to severe mechanical shock, insulator disintegrates into many small, non-sharp fragments. Trouble shooters can locate broken insulators—fast.

What's the secret? *Tempering*, a Kimble development in glass insulators that adds a new element to the many natural virtues of glass insulators. Kimble insulators are more than strong enough to meet the severe tests required.

Why not see how tempered glass can cut your line maintenance costs. Write for descriptive folder that gives complete details. Address: Kimble Glass Company, subsidiary of Owens-Illinois, Dept. EW-8, Box 1035, Toledo 1, Ohio.

KIMBLE INSULATORS
AN (O) PRODUCT

OWENS-ILLINOIS
GENERAL OFFICES • TOLEDO 1, OHIO

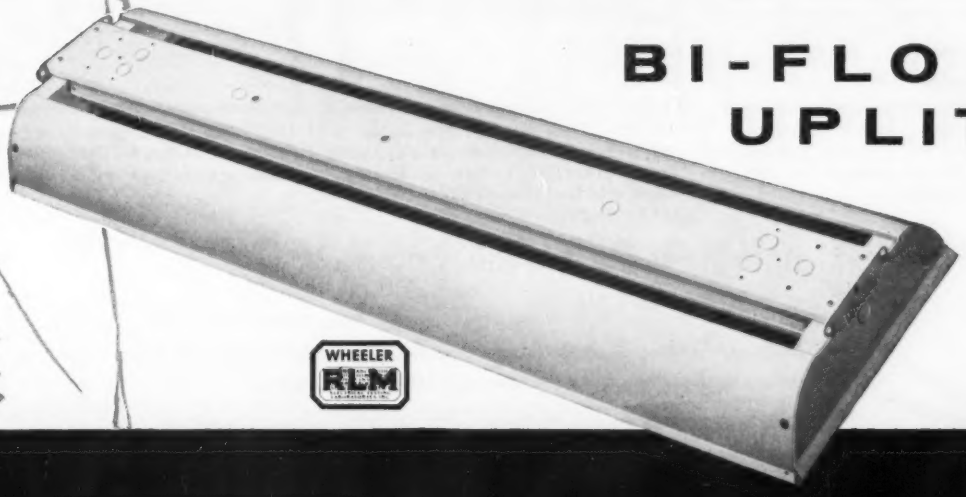
PUTTING PRODUCTION IN THE "HIGHER EFFICIENCY BRACKETS"

outstanding new industrial lighting fixture — 28% uplight! Desirable low cost!

Unique Wheeler construction! Approximately 28% of the total fixture illumination is UPWARD and 72% is downward, thus providing greater seeing comfort, better brightness ratios and higher quality illumination.

30° cross-wise shielding of both lamps reduces direct glare to a minimum. Write for Bulletin No. 97.

BI-FLO UPLITER



WHEELER RLM

There's a Wheeler Incandescent or Fluorescent Lighting Fixture to meet every industrial requirement.

Wheeler Reflector Company

275 Congress Street - Boston, Mass.

Distributed Exclusively through Electrical Wholesalers

Certified Lighting for a Better America

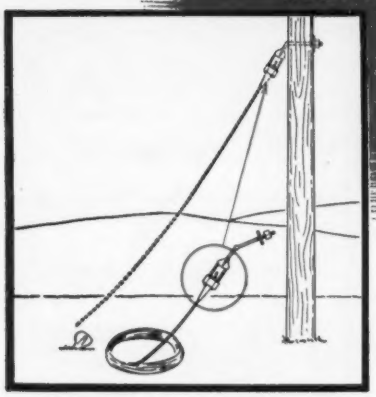
75th Anniversary *1881-1956*

Complete a down-guy IN 5 MINUTES?

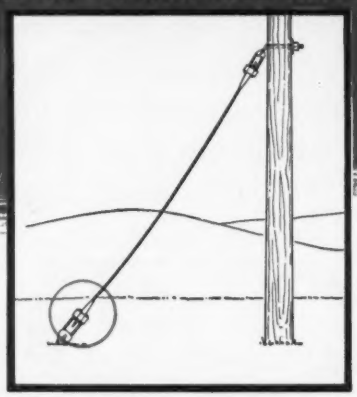
We'll bet your man can do it with . . . STRANDVISE®

Don't take that bet until you've had some of your men try this sure, simple, easy way to install down-guys — we'll even bet that you'll be boasting that some of them can do it in *less* than five minutes.

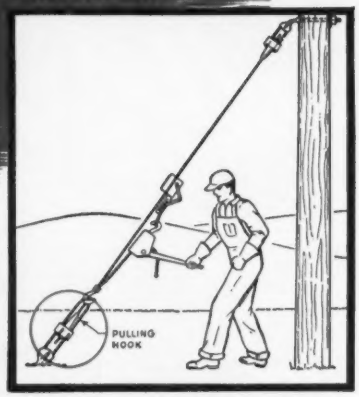
FOLLOW THESE THREE EASY STEPS:
HOIST AND COME-ALONG NEED NEVER BE IN THE WAY



STEP 1 Assemble STRANDVISE to pole-top hardware and complete pole-top installation. Do not cut strand from coil; it is usually wasteful.



STEP 2 Assemble STRANDVISE to anchor eye. Measure strand hand-tight to lower end of STRANDVISE, then cut. Insert strand and feed through STRANDVISE, just hand-tight.



STEP 3 Now place come-along and hoist and apply tension. It's just as easy for double or triple guys as it is for singles.

NOW STEP BACK, THE JOB IS DONE . . .
IT'S JUST THAT SIMPLE

And here's a new pulling hook that makes the job even easier, although a pulling hook isn't needed if anchor rod will take a come-along.

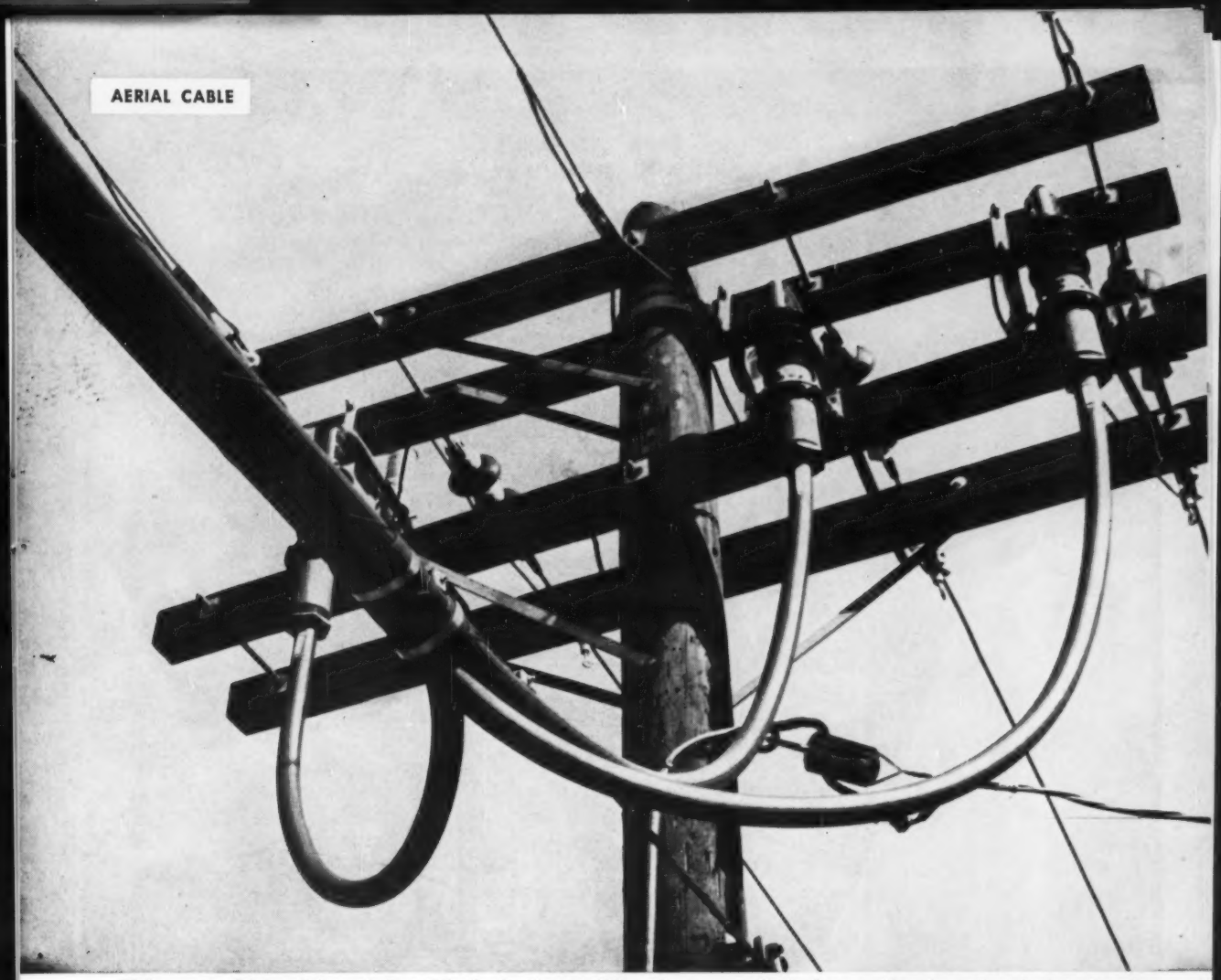
Have some of your men try the Reliable STRANDVISE for easy five minute down-guy installations . . . we'll gladly supply samples for the test.

STRANDVISE — available for 3/16" through 7/16" strand, all grades. Stainless steel (rigid) and galvanized steel (flexible) bails for all types of guy attachments.

Reliable POWER LINE CONNECTORS AND CONSTRUCTION SPECIALTIES

ELECTRIC COMPANY 3145 CARROLL AVENUE CHICAGO 12, ILLINOIS

OVER 45 YEARS OF SERVICE TO THE UTILITIES



High-ozone resistance of Anaconda Type AB-insulated cable pays off here where ozone-cutting is often a problem when ordinary insulation is used.

New aerial cable gives ozone the air

New Anaconda Type AB-insulated cable has *highest* resistance to ozone.

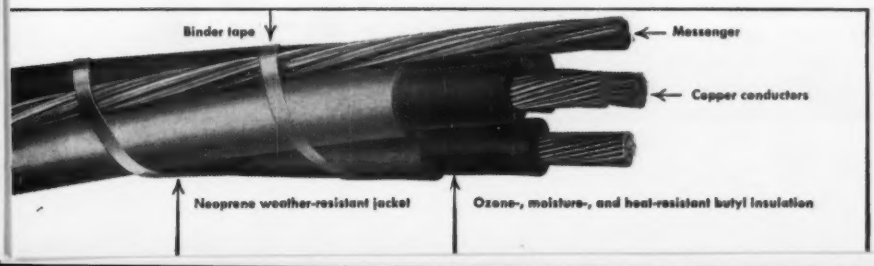
Ozone-cutting – No. 1 enemy of high-voltage insulation – can be arrested.

ANACONDA Type AB butyl insulation on aerial and other high-voltage cable ends this problem.

Type AB is *inherently* resistant to ozone. Moreover, this high resistance to ozone has enabled Anaconda engineers to concentrate on other properties – to develop Type AB's other electrical and physical properties to the very peak of performance.

Proof is in a series of tests – made over a period of years by Anaconda engineers. These tests – covering ozone, temperature, moisture absorption, dielectric strength, ionization level, aging, and other properties – show clearly the superiority of ANACONDA Type AB butyl insulation.

Put your cable problems up to the Man from Anaconda. Anaconda Wire & Cable Co., 25 Broadway, New York 4, N. Y.



ANACONDA®

AERIAL CABLE

MOLONEY'S NEW VALVE
DRAINS TRANSFORMERS . . . *THOROUGHLY*

All the oil drains out freely with Moloney's new valve because the valve's seat is ⅛ inch below the transformer tank's bottom. This assures removal of sludge and sediment from the tank bottom, and because such sediment is removed, filtered oil remains clean and pure when replaced in transformers.

But that's not all. Moloney's *compact* new valve actually requires less floor space than formerly. Leaky pipe threads are eliminated too, because the new drain valve *bolts* to a heavy flange, and it's sealed to the flange by a corprene gasket that's confined in a gasket retaining groove. In addition, the nylon-brass valve seat makes a postive seal, preventing oil leaks. The sampling valve, mounted high, has free access and plenty of space for the sampling cup. The sampling valve operates only when the drain valve is open.

Moloney's new drain valve is another reason why Moloney Transformers are better than ever . . . for your utility system.

MEES-14

MOLONEY ELECTRIC COMPANY

Power Transformers • Distribution Transformers • Load Tap Changing Transformers • Regulating Transformers • Step Voltage Regulators • Primary Unit Substations • Secondary Unit Substation Transformers • Network Transformers • Series Street Lighting Transformers • Subway Transformers Industrial Dry Type Transformers • Capacitors • Magnetic Components For Electronics

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Tree Trouble Has Many Remedies

Many utilities today show a marked change of attitude toward shade trees along distribution routes. No longer do they attempt the radical mutilations which they once offered as the alternative to "trimming trees at the ground line." Instead they are swinging toward a compromise with tree owners based on trimming only where it will leave attractive, healthy trees and resorting to other methods where trimming is not acceptable.

Some of these methods to avoid trimming, such as very high poles to span mature trees or sidearms to push wires into clear space, have been used for many years. So, too, has tree wire. But building these features into pole lines today for future clearance from recently planted trees after they reach maturity demands new skills of engineers.

Compared with these open-wire solutions, aerial cable is still in its infancy. Twenty years ago it was considered unique and too costly and inconvenient to use for distribution except under extreme duress. But the performance of these early installations won enthusiastic converts who zealously attacked the engineering problems of aerial-cable distribution. Through their efforts aerial cable can be installed today with but little more difficulty than open wire and can be worked "hot" with methods long used by linemen. Installed cost has yielded to their efforts, too, to the point where savings in tree-trimming will sometimes justify use of cable.

Underground cable remains in the luxury class. Today it is looked upon as a solution only for extreme cases, much as aerial cable was 20 years ago. But engineers show continued interest in cost-cutting methods, such as direct burial and poured-plastic joints. This is the attitude which made aerial cable acceptable. It can do a lot to put underground cable into a more competitive position.

Even as utilities apply these remedies to improve electric service in tree areas, they work toward a future in which trees will show less troublesome habits. Utilities are promoting a drastic swing to lower-growing species for street and residential planting. They have enlisted the assistance of respected tree experts and nurserymen and sponsored demonstration plantings along residential streets and in their own landscapings. And they are grasping every opportunity to get this story to home owners and municipal authorities before they perpetuate the tree problem by planting more forest trees.

The Special Feature starting on page 73 gives an up-to-date report of progress in controlling tree interference. It is clear proof that the industry is facing tree problems with a full complement of solutions.

Service Voltage Debate: To Committee

Activation last month of the EEI-NEMA Joint Committee on Higher Secondary and Utilization Voltage was welcome news to utilities and manufacturers alike. Both groups look to this committee for judicious and final determination of a service voltage to be offered as utilities outgrow today's traditional 120/208 and 120-240-v level.

What this voltage should be has been debated for nearly three years. It began with a proposal of 265/460 v for service to large commercial buildings (EW Dec 14, 1953, p.113; Jan. 11, 1954, p.75; March 8, 1954, p.80). For this application, 265/460 has already won acceptance.

Proposals to use higher voltage also in high-use residential areas quickly followed (EW Feb. 14, 1955, p.25). Debate on this new facet rang from coast to coast. Cost savings to the utility were usually conceded (EW June 13, 1955, p.82; Feb. 6, 1956, p.70). But the battle was drawn over domestic appliances for use at the new voltage level (EW June 13, 1955, p.59; Feb. 27, 1956, p.32).

Would higher voltage appliances be safe to use in the home?

Could they be manufactured to sell at the same prices as conventional appliances?

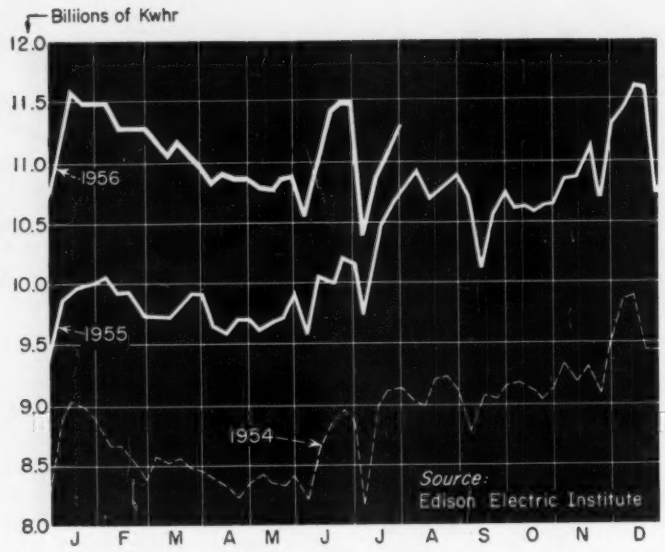
Must each customer served at the higher voltage provide an autotransformer to step down to 120 v for lighting and small appliances?

With these complications, would the higher voltage still offer worth-while savings not only to utilities but to their customers as well?

What should be the new voltage standard if it is to serve industrial, commercial, and residential customers alike?

Today the electrical industry has, in the new EEI-NEMA joint committee, a panel to evaluate these questions. Its membership assures searching deliberation of every point. Certainly the industry will hold itself ready to assist in any manner the committee may designate. For all branches share the responsibility to protect and defend the welfare of electric utility customers.

ELECTRICAL WEEK



OUTPUT

Week ended July 28
11,295,000,000 Kwhr
Up 5.3%

Atomic Energy Commission requirements—1,125,000,000 kwhr (Electrical World estimate). Excluding AEC, output increase was 3.5%

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
July 28	+5.3	+6.6	−0.3	+1.5	−2.8	+7.4	+13.0	+22.0	+11.3	+8.3
July 21	+4.8	+2.3	−4.7	+0.3	+0.1	+7.6	+23.2	+11.6	+13.0	+5.9
July 14	+4.2	+5.3	+0.4	−0.2	+9.9	+6.4	+11.3	+9.8	+11.8	+6.4

Seasonally Adjusted Index 212.8 Week Ago 210.3 Year Ago 202.6

Issue's Highlights . . . Discovery announced that fly ash can be used in making portland cement. Wisconsin Electric to supply 50,000 tons a year commercially. Utilities urged to tap $200-million market . . . How Presidential likelies stand on power . . . Coal pipeline to CEI is laid . . . England's scientists make uranium burn hotter and faster to yield efficient, 300-Mw nuclear plants . . . Dc cables may link England and France . . . Westinghouse's business booms; backlogs pile up . . . New power transformer standard includes load tap changing . . . How tree trimming is being tackled . . . KG&E and Penn P&L map house-heating drives at special rates . . . AEP weeds out bad insulators with "in stock" tests.

EEI-NEMA Joint Committee on Higher Secondary and Utilization Voltage held its organizational meeting July 26. This committee is expected to review from the appliance viewpoint proposals submitted late last year by EEI's Task Force on Higher Secondary Voltage. These proposals were that 265/460 v be adopted as standard for secondary service at higher than 120/208 or 120/240 v and that 254/440 v be an acceptable alternate . . . **Representing EEI on the joint committee are:** T. C. Duncan, Con Edison, group chairman; W. R. Bullard, Ebasco; David Burns, Detroit Ed; F. A. Cox, Commonwealth Ed; H. E. Hoebel, AG&E Service; L. G. Smith, Baltimore G&E (alternate) . . . **NEMA is represented by:** H. H. Watson, GE, group chairman; E. C. Barnes, Reliance Electric; D. K. Blake, GE; B. S. Booher, Frigidaire Div, General Motors; R. F. Lawrence, Westinghouse; F. H. McCormick, Frigidaire (alternate).

At suggestion of a federal mediator, Long Island Lighting and Local 1049 IBEW **agree to extend on meeting-to-meeting basis** the contract that expired July 31 . . . Connecticut L&P and six IBEW locals sign one-year pact calling for 6.5% wage increase and fringes . . . **3,500 IUEW workers walk out** of General Electric's large steam-turbine generator plant on "wild-cat" strike.

NEWS OF THE INDUSTRY BRIEFLY TOLD

Washington Wire . . . Atomic Energy Commission clears the way for private industry to gain access to secret information on controlled thermonuclear fusion processes. Under new rule AEC will examine fusion-data applicants on this basis: 1) Is applicant expending sufficient funds or effort on a fission project to evaluate potential of fusion process? 2) Can applicant contribute significantly to controlled thermonuclear development? . . .

In its semi-annual report to Congress, **AEC claims "notable progress"** in "every principal aspect" of the nation's atomic energy program. In an analysis to which Commissioner Thomas E. Murray did not subscribe, AEC reports that private investment reaches $358 million as against $313 million in government spending. Civilian nuclear projects represent 1,182,000 kw. . . .

Awaiting President's signature is a **bill requiring safety devices on household refrigerators** to permit them to be opened easily from inside . . . REA reports that rural electric **co-ops are nearly $100 million ahead of schedule in loan repayments;** those in arrears are at record low. Loan advances at start of year were over $2.5 billion . . . Wesley A. D'Ewart resigns as Assistant Interior Secretary after Senate fails to confirm his nomination.

Metal market observers are speculating as to **how high aluminum price will rise following any new wage contract.** As Alcoa and Reynolds Metals shut down plants, outlook is for loss of at least one week's primary production. As EW goes to press, 30,000 workers are out and 13,000 are threatening.

U.S. Treasury Department reverses itself and promulgates tentative ruling making stock dividends taxable under "two class common stock plan" of Citizens Utilities (EW, Jan. 16, p 63). Treasury had previously okayed non-taxability of stock dividends under the unique plan which provides for one class of common stock to receive cash dividends and other class stock dividends. **Interested parties must file** with Internal Revenue Service by Aug. 9 any protests against proposed new regulation and a specific request for hearing.

Kidder, Peabody & Co group **wins $10 million Jersey Central P&L** first mtg 4⅛% bonds due 1986 with bid of 101.57%; reoffers at 102.17% to yield 4%.

ABOUT PEOPLE IN THE INDUSTRY

Pennsylvania Power & Light officials are examining the 93-page rate order handed down recently by State Public Utility Commission, says **A. D. Root,** vice president-financial. The PUC ordered the utility to cut rates by $1,366,000 a year by Aug. 1 and pay refunds of $1,920,000 plus interest by Dec. 1 to 572,000 customers. However, the company received permission from PUC to delay filing new tariffs until Sept. 1.

Southwestern Public Service is again showing favorable increases in output and gross revenues, Board Chairman **H. L. Nichols** tells New York Society of Security Analysts. Company had a cold 1955 summer with record rainfall, but is chalking up $1.65 earnings per common share for fiscal year ending Aug. 31, compared with $1.54 for fiscal 1955. SPS will offer next March $5 million of bonds and about $5 million common stock.

More News About People page 158

How Do Candidates Stand on Power?

With public-vs-private power predicted as a significant issue in this fall's election campaign, whom will the Democrats support? Potential nominees, with their widely ranging views, may decide the party's power platform

The Republicans have no problem — Eisenhower's policies have been defined during his term

PRESIDENT EISENHOWER

The future direction of this country's water resources and power policy will hinge directly on the outcome of the fall election. Who the Democratic candidate is will in large measure decide what kind of power policy he campaigns on.

The Democrats will have to decide from a group of candidates whose policies range from far left of Fair Deal to slightly right of Eisenhower. Odds favor what might be termed a Democratic conservative candidate.

Where do such potential presidential candidates as Adlai Stevenson, Averell Harriman, Stuart Symington, and Frank J. Lausche stand on public versus private power?

It might help the perspective to reappraise Eisenhower's position.

Eisenhower has been called a "middle-of-the-roader." When he took office he announced intention of halting the spread of the federal government in business, cutting federal spending, and encouraging greater local participation as against dependence on the federal government. By and large this course has been followed, allowing for modifications as a result of a Democratic-controlled Congress in the last two years.

The Democratic Congress has, at times, forced upon the Administration larger appropriations than were requested for power programs. In one instance, Congress frustrated an Administration-supported economy move to raise Southwestern Power Administration rates.

Since 1953, when he branded Tennessee Valley Authority as "creeping socialism," Eisenhower has had to be on the defensive with regard to this agency. Certainly, the attendant publicity to the Dixon-Yates affair and the revenue bond financing arguments have forced a public reappraisal of this mammoth agency.

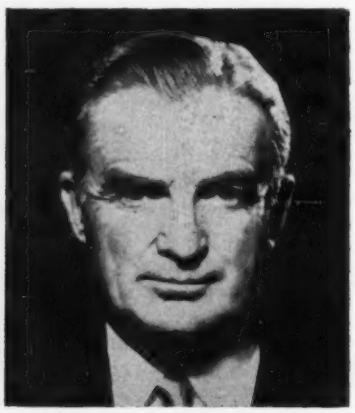
The Eisenhower policy has triumphed in such instances as defeat of the federal Hells Canyon Dam and expansion of the proposal for government construction of atomic power generation plants. At the same time, Eisenhower has successfully pushed the huge $1.7-billion Upper Colorado project, demonstrating his position that where private capital is unable or unwilling to undertake a project, the federal government should. In this category too, falls the $156-million Fryingpan-Arkansas project, defeated despite Administration support.

In retrospect, it can be said there has been fairly close adherence to the main Eisenhower thesis: less dependence on the federal government for power supply; greater reliance on the "partnership" approach; and govern-

(*Continued on page* 66)

STEVENSON: LIKELY MAN

KEFAUVER: RUNNING MATE?



SYMINGTON: DARK HORSE?

Utilities Urged to Push Fly Ash Sales

- **Utilities are encouraged at special conference to concentrate efforts upon achieving profitable markets for this steam plant waste**

- **First step is that of fitting fly ash into $33-billion Federal Highway Construction Program**

What is hoped to be the start of a concentrated effort by utilities to market fly ash was launched July 31 in Pittsburgh. More than 150 representatives of major utilities, government agencies, research organizations, railroads, equipment manufacturers, and fly ash users joined in a day-long conference sponsored by Electrical World magazine.

The meeting stressed the potential for fly ash in the $33-billion Federal Highway Construction program. There are strong indications that the use of fly ash in roads could cut the cost of the federal program by $500 million and provide electric utilities with more than $200 million in added income.

H. H. Russell, project engineer, Bituminous Coal Research, Inc, reported that utilities and industrial plants are currently producing 8¼ million tons of fly ash annually. Russell said: "To sell this 8¼ million tons of fly ash we must consider the large scale possibilities and see how fly ash can be incorporated. The highway outlet seems to offer the largest single potential."

Fly Ash Roads Already Exist

"In the past, the use of fly ash in road building has been tried experimentally in several states. Some of these test roads have served very useful purposes and have been influential in promoting this fly ash market. There are at present fly ash roads in Nebraska, Alabama, Kansas, Illinois, Wisconsin, Minnesota, and New Jersey. Pennsylvania has one scheduled and there is preliminary interest in several other states."

Fly ash in road building, Russell added, can save significant amounts of money. In the case of the Alabama road it made possible a savings of 15¢ per sq yd of concrete. The fact that this is a federal aid highway shows that the federal program will approve fly ash in highway construction. And it clearly indicates that the performance and economy attributed to fly ash have been recognized, he declared.

Walter H. Price, head of the Bureau of Reclamation's engineering laboratories at Denver, Colo., commented on the use of fly ash in heavy construction. Price said: "Fly ash was first used by the Bureau in 1942 in the repair of a 1,460 cu yd eroded area in the concrete of the Arizona spillway tunnel at Hoover Dam.

Since then, it has been under constant investigation in the laboratory for possible use in concrete for Bureau projects and in 1948, after extensive laboratory tests, it was decided that it would be to the advantage of the government to permit the use of fly ash as a replacement of up to 32.4% of the portland cement in the construction of Hungry Horse Dam, a structure 564 ft high, containing 2,935,000 cu yd of concrete.

Since then, the Bureau has issued a total of nine specifications which have permitted the use of a natural pozzuolana or fly ash in concrete," he added.

Other speakers on the program detailed their company's experience and success in selling fly ash. Possible roadblocks in the fly ash sales program were widely discussed with all present contributing to the possible solution of these problems.

A-C Makes Fly-Ash Cement . . .

. . . at its development laboratory. The waste substitutes for shale or clay in manufacture of portland cement. Wisconsin Electric will supply 50,000 tons a year commercially

Fly ash can be substituted for shale or clay in the manufacture of portland cement.

This was announced by Allis-Chalmers Manufacturing Co at the fly-ash conference in Pittsburgh (see story above). The discovery was made at A-C's Carrolville development laboratory pilot cement plant, the company revealed.

Use of fly ash in cement promises a new outlet for large tonnages of the waste. It creates advantages which both utilities and cement producers can explore to mutual advantage.

Meanwhile, Wisconsin Electric Power Co also announced that it plans to supply about 50,000 tons of fly ash a year to the first unit of the Marquette Cement Co's new Milwaukee plant. About 15 to 16% of Marquette Cement Co's raw material feed will consist of fly ash.

Because the "ACL" system requires a pelletized feed, fly ash is ideally suited to the process. Raw materials are carefully blended to proper proportions prior to pelletizing. In pellet form, the proportions are maintained to assure uniformity of mix throughout the process and in the product. In addition to using fly ash, the ACL system will produce cement with exceptionally low fuel requirements and minimum dust losses.

In outlining other developments in the utilization of fly ash, A-C pointed out that carbon removed from fly ash is possible with commercially available gyratory screens. With this equipment, and screening at 200 mesh, about 50% of the combustibles can be removed. These results were derived from tests on about 50 samples of fly ash from power plants throughout the country. Screening may thus offer a simple and economical way of beneficiating high carbon ash in many installations.

How Candidates Stand

(*Continued from page* 64)

ment intervention only where absolutely necessary.

In the light of the foregoing, the Democratic candidates line up somethink like this: Harriman is an extreme liberal and could be expected to pick up where Truman left off. Closer to the Eisenhower position would be Stevenson and Symington. Opinion on Lausche places him in the "extreme conservative" category—even to the right of Eisenhower.

A Rundown on the Candidates

Individually, this is the picture:

Adlai Stevenson: In 1952, he was only slightly at odds with Eisenhower. In some respects this may be so today. But there is the question of whether he is being forced to move to the left to gain votes. In 1952 he said: "Works like Grand Coulee and Bonneville were beyond the capacity of private enterprise to undertake. If the government had not built them they would not have been built at all. Hard American common sense concludes that where private enterprise is unable or unwilling to develop resources, government should."

In the recent California primary campaign, he advocated partnership development of water resources in San Joaquin Valley, while Kefauver pushed federal development.

Stevenson was for the federal Hells Canyon Dam and is for New York State Power Authority development of Niagara. On the other hand, earlier this year, he said: "I don't argue . . . for public power for public power's sake. But I do argue for cheap power which can be used not just today but tomorrow as well, and I argue for flood control and an irrigation potential."

Stuart Symington: Although he supported the federal Hells Canyon Dam, and the Lehman-Buckley Niagara bill, the Missouri Senator has frequently displayed a conservative approach.

In perhaps his most revealing disclosure, Symington this year told an electric cooperative convention he believed when funds are not available from private sources, the government must take action. But he added:

"I do not believe the federal government should supply the electric needs of this country; and I do believe that a fair proportion of the power flowing from federal projects, as it does now, should go to industry and private utilities as well as to government agencies, municipalities, and cooperatives."

LAUSCHE: PARTNERSHIP MAN? HARRIMAN: ANOTHER NEW DEAL?

Showing concern about TVA's growth, he has said TVA should remain intact, but should not be allowed to spread beyond its borders.

Averell Harriman: Considered to be even more doctrinarily liberal than Kefauver, the New York governor is a staunch New Dealer.

He has been a militant supporter of the Lehman-Buckley Niagara bill. In denouncing private utilities' opposition to this bill, he has charged them with wanting to "seize" the states' water power.

Addressing Kansas farmers last month, Harriman said: "We should restore the operation of REA to its original conception. The requirements of REA coops are doubling every five years. Instead of stifling their growth, as Eisenhower has, we should help them meet requirements."

In his inaugural address as governor in 1955, he said: "Our abundant water resources can spread their benefits of low cost electricity throughout our state." This, no doubt, would also be his nation-wide philosophy, with emphasis on federal development.

Frank J. Lausche: The Ohio governor has had little opportunity to take a stand on major power issues. But he has indicated he favors the Eisenhower partnership policy.

Although Estes Kefauver has withdrawn from the presidential race, reports of a drive to push him for the vice presidency make his views on power important to the Democrats. He has persistently urged a greater federal role in the power field and has supported all measures that would have achieved this, including the Hells Canyon, Gore reactor, and Lehman-Buckley Niagara bills. He was leader in the Dixon-Yates fight and has consistently accused the Administration of trying to dismember TVA and of trying to strangle Rural Electrification Administration.

Action of 84th Congress Favored Private Utilities

Bill	Disposition
Hells Canyon	Senate defeated
Gore Reactor	House defeated
Niagara Redevelopment	Died in House Rules Committee
States Water Rights	No action taken
TVA Bond Financing	No action taken
Southwestern Power Rates Freeze	Sent to White House
Government Atomic Insurance	No action taken
Holding Company Act Amendment	No action taken
Passamaquoddy Tidal Projects	Study authorized
Upper Colorado River Storage	Congress passed
Fryingpan-Arkansas Project	House defeated

Coal Pipeline Is Now Laid

The 108-mile-long coal slurry pipeline linking Georgetown, Ohio, with Cleveland Electric Illuminating Co's Eastlake power plant has been laid. The last section was dropped into place July 20, but the line won't go into operation before Dec. 1. CEI's drying plant (the line's terminus) is nearing completion, but may take several more weeks before getting into operation. Several pipeline pumping stations also remain to be finished.

This $12-million project, the first of its kind in the U.S., will provide about 80% of the coal supplied to the Eastlake station. About 1.3 million tons a year will come directly from a mine at Pittsburgh Consolidation Coal Co, which is building the line.

It is estimated that the pipe will reduce coal transmission costs substantially. After the project is "buttoned up," the coal company plans to pump water through the line for a month or so to test pumps, to clean the line, and to check it for pressure. CEI may buy the line in 15 years if it chooses. Meanwhile CEI will be helping with the pipeline's cost.

Hotter Uranium in England

British engineers are now talking about nuclear power stations of 300-Mw capacity and capital costs of less than $224 a kw. Reason: There have been some great strides made in nuclear research and development.

Here are some of the new design aids: A way has been found to jump substantially the power output of nuclear plants without increasing size and cost. Most important is the discovery of how to make uranium fuel burn faster and hotter (600 deg C as opposed to 400C) to increase efficiency. New metallurgical developments will enable engineers to can uranium rods in other materials to give quicker heat transfer to carbon dioxide. And methods of welding steel plate thicker than 2 in. will enable larger reactors to be built at about the same cost.

What Price Their Land?

Kentucky's Lyon County Courthouse was packed on the night of July 11 as more than 100 land-owners from Eddyville (pop. 1,840) and Kuttawa (pop. 794) crowded in to hear about the U.S. Engineers' big proposed dam on the Cumberland River which, in reservoir, would flood most of the two towns.

Sitting in windows and standing in aisles, the residents wanted to know two things: Where to go, and how much they would get for their land.

The first answer was easy. The two towns could merge at another site. But the answer to the second question was less direct. Because of the prolonged uncertainty over this dam, practically no land has been bought or sold for 10 years. The going price for farms and residences is unknown.

Olin J. Moses, chief of the real-estate division of the Nashville engineers office, suggested that sales in "comparable areas" would probably have to serve as a basis for land appraisals. Meanwhile, backed by a $1.1-million Congressional appropriation, drilling crews already are hunting a place to put the dam.

Sporn Plant Havoc: $450,000

Fire and explosion at the insured, 600,000-kw Philip Sporn Plant, Graham Station, W. Va., wreaked about $450,000 damage July 18, estimates Paul T. Schneider, assistant plant manager. Repairs, already begun, will require three or four months.

The explosion, which occurred at 7:12 p.m., was caused by a smoldering fire in a boiler coal hopper which set off an accumulation of coal gas. The blast blew out a large section of an outside wall. Falling masonry damaged the plant's laboratory, machine shop, locker rooms, cafeteria, and storeroom.

Owned jointly by Appalachian Electric Power Co and Ohio Power Co, both subsidiaries of American Gas & Electric Co, the plant's total generation was curtailed briefly until full damages could be determined. Otherwise the explosion did not affect normal operation.

Vancouver Cable Being Laid

The Ocean Layer, a 4,600-ton ship, is now sinking cables to link the lower mainland of British Columbia to Victoria on Vancouver Island. To be installed by Oct. 1, the cables will operate at 138 kv, but will be tested up to 600 kv. They will take off into the gulf at the mainland end from a 400-ft reinforced concrete tunnel which will slope down a 200-ft embankment to the water. Brackets will carry four active cables and a spare on tunnel walls. Eventually seven cables will be placed in service.

The $6-million contract to make, deliver, and lay the cable was awarded British Insulated Callenders Cables, Ltd., by British Columbia Electric Co.

DC Power Link Urged

A single cable carrying direct current across the channel between England and France may be the answer to bulk electricity interchange desired by the two countries. An earlier proposal for a series of cross-channel ac cables was scrapped in favor of the dc proposal which has been made to both governments by a joint committee representing Central Electricity Authority and Electricite de France.

Although mercury arc rectifiers will be required at both ends to convert the ac to dc or vice-versa, it is thought that one direct-current cable, instead of several alternating-current cables, will be cheaper.

Westinghouse Order Backlog Grows

Production generally is above pre-strike levels and sales are high. Income for second quarter is 38¢ a common share vs 98¢ last year

A roundup of recent Westinghouse Electric Corp announcements highlight the following developments:

• Net income for the second quarter was $6,862,000, Pres Gwilym A. Price reported. This is equal to 38¢ a common share *vs* 98¢ a share on $16,635,000 net income for the same period in 1955. Price said the growing backlog of orders is now 38% higher than a year ago. He placed the first quarter losses from the five-month strike at $18,575,000 equal to $1.14 a common share. Compared with 1955's second quarter, sales in the same period this year showed the highest gain in consumer products (24.3%). Defense products sales were up 12.6% and heavy apparatus and general industrial products dropped 9.2%, Price said.

• East Pittsburgh divisions are loaded to capacity and producing 20% above pre-strike levels. Bookings are running ahead of billings by 25 to 30% . . . Now booked is an $8-million order for the largest 1,800-rpm generator ever made, a multi-million-dollar order for ignitron rectifier potlines, a Navy development contract for specialized switchgear equipment, and a major order for compressed air circuit breakers . . . Officials see growing activity in nuclear power plant instrumentation and controls.

• At Buffalo, N. Y., production lines are being expanded for industrial motors . . . Production is about 15% higher than pre-strike level . . . Backlogs trending upward as indicated by bookings which, for first five months of 1956, exceeded billings by 111%.

• Watt-hour meter output is running 140% above pre-strike level . . . Second quarter bookings for elevator division are up 57% over 1955 . . . New electric stairway plant being built at Dover, N. J., will employ 200 and boost productive capacity 20%.

• X-ray division production running 150% over pre-strike level . . . Backlog for defense products at Baltimore divisions is expected to run materially higher at year end than at close of 1955 . . . Company now producing Shippingport nuclear power reactor for Duquesne Light Co is working with Pennsylvania Power & Light Co on development of a homogeneous reactor, and has won responsibility for 134,000-kw Yankee Atomic Electric Co's project in New England . . . Several new atomic research and manufacturing facilities now being constructed . . . Work is progressing on prototype reactor for first nuclear-powered naval surface ship.

• In consumer field, television production is up 70%, radio about 6%. Video bookings for third quarter are up 60% over same period last year . . . Second quarter appliance sales topped 1955 period by 36%. Major appliance billings rose 23.5% . . . Room air conditioners billings climbed 162.5% over 1955 period.

• Employee morale is high. Some divisions report absenteeism "decidedly below" pre-strike levels. Employment in atomic power group (not strike-affected) is up 20% in last six months. X-ray employment is up 150% over pre-strike; meter employment up 10%; East Pittsburgh up 5%; motor and control up 13%.

• Plans for a multi-million dollar distribution transformer plant in Athens, Ga., were revealed late last month. An addition to its transformer division, the 750,000-sq ft building will about double production of pole-type transformers. Gordon C. Hurlbert, manager of the distribution transformer department in Sharon, Pa., will manage the new plant. Production is to begin in mid-1958.

Industry: A Lush Market

. . . but competition is getting tougher. About 5 million hp in internal combustion engines will compete with utilities in power picture, SEE's Power Sales Committee hears

The industrial market for power sales is becoming more lush, but other power sources are giving utilities tougher competition. How utilities can strengthen their industrial sales positions was discussed at Southeastern Electric Exchange's Industrial Power Sales Committee meeting in Roanoke, Va. Items:

• Industry will direct more attention toward meeting competitive market conditions and less to such things as running power plants, foresees H. W. Memmott, Connecticut Light & Power Co. Cost comparisons, when used wisely with good sales techniques, can be helpful—particularly when backed by good engineering, continuous contact, and a sincere approach to the customer's problem.

• Despite rising labor and fuel costs, internal combustion engines still remain attractive to industries. About 120,000 of them—representing 20 million hp—will be sold this year, said Lee Schneitter, Ebasco Services, Inc. About 25% of this capacity will compete with utilities.

• Great industrial growth compels utilities to sell aggressively the values of electric service—and to sell it at compensatory rates, declared W. T. Hess, Louisiana Power & Light Co. And selling the value of service, he said, will help eliminate attacks by customers and regulatory bodies on the rates and rate of return.

• The heat pump holds great promise for industry. It is "a natural" wherever temperature and humidity must be controlled, pointed out American Gas & Electric Service Corp's Paul W. Emler. And many more applications exist where heat pumps can provide large quantities of hot and cold fluids, in some cases simultaneously. But these applications often must be individually engineered and sold, he declared.

• General Electric Co's E. A. Linsday stressed the value of ventilated industrial lighting units.

New Power Transformer Standard Includes Load Tap Changing

Proposed ASA C57.12 provides:

- Ratings to meet popular demands
- Control circuitry to permit parallel operation of units by different makers
- Guidance for design of LTC units of larger kva and higher voltage

Summary of Major Features of Proposed New American Standard on Load Tap Changing Transformers	
Terminology	Load tap changing transformer (LTC).
Kva Ratings	1,000-10,000 Kva, three-phase.
High-Voltage Ratings	6,900-67,000 volts inclusive.
Low-Voltage Ratings	2,400-15,000 volts inclusive.
Tap Range of De-energized Tap Changer	Approximately 10% with two 2½% full-Kva taps above and below rated voltage.
Tap Range — Load Tap Changer	20% with approximately 10% plus and 10% minus range.
Number and Size of Steps	32 ⅝% steps.
Method of Adjustment	Automatic control by voltage regulating relay with provision for motor or hand operation.
Parallel Operation with Other Transformers	Reverse reactance on all transformers. Provision for addition of circulating current method.
Bushings	Electrical and mechanical standardization included for ratings 23-67 Kv inclusive.
Impedances	Standardized at levels 0.5% greater than conventional rating.
Control Circuit Accuracy	Established at class 1 when supplied by external source of 0.3 accuracy class.
Location of Parts	Standardized location wherever practicable as to accessories, control cabinets and operating mechanism.
Alternative Standardized Features Available	Alternate choice of high-voltage ratings and phase within practical range, alternate phase displacement, fan cooling or future fan cooling provision, current transformers for relaying or metering, etc., additional tests.
Alternative Features not Available in this LTC Standard	Y-delta terminal boards, phase-changing terminal boards, series multiple arrangements.

H. M. JALONACK, Chairman, ASA C57 Subcommittee on Power and Distribution Transformers, Pittsfield, Mass.

In the May 31, 1954, issue of Electrical World the author described in question and answer form the objectives and significance of a new American Standard on Power Transformers. The most important requirements in the new standard were summarized and the basis given for their selection. This standard, identified as ASA C57.12-1954, covered step-down power transformers of the conventional type, in single-phase kva ratings through 5,000 kva and 3-phase kva ratings through 10,000 kva with high-voltage ratings 2,400 v through the 67-kv class and low-voltage ratings from 480 v through the 15-kv class.

The next logical step led to the standardization of power transformers in the same general range of sizes and voltages but equipped with means for automatically changing taps during excitation and load. The first and major part of this work has now been completed and publication of the new standard authorized as Proposed American Standard (ASA C57.12). After a reasonable period of use allowing time for consideration of suggested improvements, additions, or deletions, such modifications will be balloted upon preparatory to a change in status from Proposed American Standard to American Standard.

In this article the question and answer method is again used to explain more fully the objectives and major requirements in the new standard.

1: What are the broad objectives of this standard?

Answer: Substantial and continued growth in the use of load-tap-changing transformers has indicated the desirability of establishing sound specifications for this type of apparatus. The advantages of standards from the standpoint of cost reduction and procurement time are well known and would, of course, be as applicable here as with other electrical apparatus.

The committee had several additional specific objectives.

The first was to select those load-tap-changing ratings which were in sufficient demand to justify complete and detailed electrical and mechanical standardization and to develop standards for these ratings. A second objective was to establish control-circuit current levels and phase relationships so that load-tap-changing transformers made by different manufacturers could operate successfully in multiple with each other. These two objectives are realized in the new standards.

The third objective in this standard is one the committee believes will evolve from the first two; namely, that many of the detailed specifications will be applicable to transformers of much larger kva and higher voltages than the ratings covered in the standard even though complete standardization in these larger units might not prove justified from an economic or application viewpoint.

2: What is correct terminology for this type of transformer?

Answer: The new standard terminology identifies these units as Load Tap Changing or LTC transformers. Formerly two names were in general use, "Load Ratio Control" or "LRC" and "Tap Changing Under Load" or "TCUL". Various names were reviewed and discarded as being either involved or misleading. The final name selected, although not perfectly describing the functions of the added mechanism and controls, appeared to be the most suitable brief terminology that could be adopted.

3: In what way do the ratings in this standard differ from those for the conventional type standard?

Answer: The single-phase ratings have been deleted since the use of single-phase transformers with load-tap-changing is negligible. (Single-phase, step-voltage regulators, and tap-changing autotransformers usually designated as "regulating transformers" are outside the scope of these particular standards.) The 3-phase ratings both as to kva and voltage groups are identical with those of the conventional power transformer standards except that the 480-v and 600-v low-voltage ratings were eliminated. Power transformers with low-voltage ratings of 600 v and less are in modern practice placed at or close to the load center so that automatic tap changing represents the exceptional case and therefore does not justify the establishment of standards covering it.

4: What is the basis of the provision made for load tap changing?

Answer: The LTC mechanism provides approximately 10% plus and 10% minus automatic adjustment in 32 steps each 5/8%. This amount of automatic tap adjustment has been widely used in recent years and appears to meet operating requirements in all but a few exceptional cases where greater range is needed. While for some applications a smaller range might prove suitable, standardization on a smaller range would not result in any substantial cost reduction in the transformer or tap changing mechanism. It might very well, however, divert many applications requiring the full range toward the use of non-standard transformers in the area covered by the standards, thus defeating the basic purposes of the standard.

The choice of thirty-two 5/8% steps, 16 raise and 16 lower, was also a natural one. In the earlier days of load-tap-changing mechanisms sixteen 1¼% steps were frequently used and even eight 2½% steps were sometimes considered adequate. The trend, however, was to smaller steps in the interest of better voltage regulation, and thirty-two 5/8% steps appear to represent the maximum fineness of steps required for all practical purposes.

5: As automatic load tap changing is provided, why is it also desirable to provide a manual tap changer for de-energized operation?

Electrical Characteristics of Apparatus Bushings

(Used with Outdoor Power Circuit Breakers and Outdoor Transformers)

Voltage Class Kv	Creepage Distance Minimum Inches				60 Cycle Withstand 1 Min Dry — Kv				60 Cycle Withstand 10 Sec. Wet — Kv				Impluse — Full Wave Dry Withstand Kv (1.5x40 ms)			
	Prop Std	Previous Transformer	Prev OCB	Adopted*	Prop Std	Prev Tran	Prev OCB	Adopted*	Prop Std	Prev Tran	Prev OCB	Adopted*	Prop Std	Prev Tran	Prev OCB	Adopted*
23	17	No standard established	17	17	70	70	85	70	60	60	70	70	150	150	170	150
34.5	23	but usual practice as	26.5	26.5	95	95	115	95	80	80	100	95	200	200	230	200
46	30	per proposed	35	35	120	120	150	120	100	100	130	120	250	250	290	250
69	44	column	48.5	48.5	175	175	205	175	145	145	180	175	350	350	420	350

* If flashover tests are required, a parallel test gap shall be used to limit the applied voltage to not more than 105% of the withstand voltage given in the table above.

Answer: One of the major elements in a successful standard is to provide the maximum degree of flexibility within the standard unit. All systems in the same nominal voltage class do not operate at the same levels. The de-energized tap changer allows the transformer rating to be adjusted to the system level without encroaching on the valuable automatic tap range.

Another use that is sometimes made of the de-energized tap changer is to use it to adjust the output-voltage to a higher level than normally required at no load so that the automatic tap changer bucks the voltage down. The effect is then the same as providing a transformer with a higher automatic raise range than the 10% provided. For example, if the de-energized tap changer is set to raise the no-load output voltage 2½% higher than desired and if the automatic tap changer bucks this voltage to normal, the transformer will in effect be providing a 12½% raise range and a 7½% lower, a combination sometimes required.

6: Why are the impedances established at a higher level than in the case of conventional transformers?

Answer: The impedances of LTC transformers are at 0.5% level above those of the conventional units. In the LTC transformer ratings covered by the standard, a poorer space factor than in conventional transformers is inherent either because of the additional tapped-out sections of the winding or because of the use of a series transformer. It is quite unusual to operate a conventional unit in parallel with an LTC transformer; but in cases of emergency where this might be done, the LTC unit would be set on manual rather than automatic control and the effect of the difference in impedances on the load division partially offset by the tap position used on the LTC unit.

The matter of parallel operation of several LTC transformers is answered elsewhere in this article.

7: It was previously stated that the electrical characteristics of the 23,000-69,000-v bushings were under consideration. Is electrical as well as dimensional standardization on these four classes of bushings now complete?

Answer: Yes, the new standard covers both the dimensional and the electrical characteristics of these bushings. For a number of years the 60-cycle, one-minute withstand voltage, the 60-cycle, ten-second wet withstand, and the full-wave impulse, dry withstand voltages were at different levels for outdoor circuit breakers and transformers in the 23 to 69-kv classes. In higher voltage ratings the figures were identical.

Creepage distances as well as the 60-cycle and impulse withstand voltages on the 23 to 69-kv classes of transformer bushings were at a somewhat lower level than the bushings for correspondingly rated outdoor circuit breakers. Although the performance in each case had been successful, it did not seem desirable to many operators to reduce the creepage on circuit breakers bushings.

On the other hand, it did not seem reasonable to require substantially higher withstand values on transformer bushings than had proven to be thoroughly adequate. After a careful review of the operating and design factors a successful compromise both as to creepage and withstand values was reached. The table shows the original proposals, the previous transformer and circuit breaker levels, and the values finally standardized.

A large degree of credit for this successful compromise must be given to members of the ASA 76 Committee which was reorganized on March 23, 1955, under the chairmanship of John R. North with Gordon W. Clothier as Secretary. The approved scope of this committee's work is: "Standards and test codes for all apparatus bushings and including roof, floor and wall bushings, but not potheads for cable terminals, nor insulators for back connected disconnecting switches, nor bushings for communications equipment."

At present the committee is studying intensively the matter of dimensional standardization (the electrical standardization being complete) for bushings in the range above 69 kv and through 287.5 kv. A principal problem to be resolved is the economic feasibility of obtaining dimensional interchangeability between transformers and circuit breakers in these higher voltage ratings. The committee also plans to study standardization of bushings that are in voltage levels below 23 kv.

8: What routine tests, if any, have been established for LTC transformers?

Answer: All of the routine tests established for conventional units will apply to LTC, and additional ratio, impedance, and load loss tests are established for various positions of the load tap changer.

9: What provision is made for parallel operation of LTC transformers?

Answer: Making provision for parallel operation required a considerable amount of study. Not only were several methods for parallel operation in general use, but the control circuit constants varied between manufacturers. The standard now includes means for reversing the reactance element of the line-drop compensator so as to operate with other standard transformers by the reverse-reactance method. It also includes space for mounting the additional equipment required for parallel operation by the circulating-current method. As an essential part of the latter method for paralleling standard LTC transformers of different manufacture, the magnitude of the circulating current amperes is specified as well as the phase angle between the line-drop compensator potential supplies and the current delivered by the current transformers.

10: What is the accuracy of the automatic control equipment, and under what conditions does it apply?

Answer: The automatic control equipment accuracy is specified as Class 1 as defined in the ASA C57.15 Standard. This accuracy class is, however, contingent on the accuracy class of the potential source for the control, this potential source being supplied by the user. To obtain this Class 1 control accuracy, the potential source must be of 0.3 accuracy class with the total operating burden carried. The automatic LTC control equipment burden is limited in the standard to a maximum of 60 va.

11: What are some of the important features incorporated in the switch compartment and motor mechanism?

Answer: In this part of the standard every effort has been made to incorporate the latest and best practices in the general load-tap-changing field as applied to LTC transformers in the kva and voltage scope of this standard. Included among these are:

a. Sealing of the arcing switch compartment from other compartments and from the main tank so as to prevent the transfer of liquid or arc-generated gas from the arcing switch compartment.

b. Provision for the escape of gas produced by the arcing so as not to build up pressure in the arcing switch compartment.

c. Removable cover providing access to the arcing switch compartment without opening or lowering the oil level in the main tank, thus reducing maintenance time and expense.

d. Hinged and removable arcing-switch compartment covers where cover weight is 35 lb or greater, and handles for covers weighing 35 lb or less. These provisions insure convenient and simplified handling methods during inspection or maintenance of the arcing switch members.

e. Provision for manual operation of the driving mechanism. Measures provided for the safety of personnel include: The specification of an electrical interlock if the manual operating means consists of a hand crank or spoke-type of hand wheel. This interlock is to prevent operation by the motor should it become accidentally energized while the crank or spoke-type hand wheel is engaged.

f. Mechanically operated electric limit switches and mechanical stops to prevent overtravel beyond maximum raise and lower positions. This feature provides positive assurance against damage to the mechanism which could result from overtravel beyond safe design limits.

12: What are some of the important features incorporated in the control system?

Answer: As in the case of the switching and motor mechanism, the control also embodies the features for which operators have expressed strong preference. These include:

a. Time delay for the first tap change with an adjustable range of 15 to 60 seconds. Time delay on the first tap change prevents unnecessary operations of the equipment on short voltage swings. The adjustment of 15 to 60 seconds provides ample range to cover various operating conditions. After the initial waiting period, further delay is undesirable; and the tap changing mechanism proceeds to make the full adjustment indicated by the control relay.

b. Facilities for adjusting the voltage level of the voltage regulating relay from 110 to 130 v and for adjusting the band width. Adjustment facilities for voltage level and band width provide the necessary flexibility for the operating conditions of individual users.

c. Switches to provide automatic operation or non-automatic operation with intermediate off positions.

d. Potential terminals for reading the voltage supplied by the potential service to the automatic control equipment.

e. Overcurrent protective devices for the potential circuit and for the motor control power circuit.

f. Screw base lamp socket with switch for providing a source of illumination within the cabinet, and a convenience outlet. A heater with manual switch in the control cabinet is included to provide a means of safeguarding against condensation within the cabinet under certain ambient and atmospheric conditions.

g. A position indicator with maximum and minimum indicating hands with provisions both for reading and resetting from the base of the transformer and capable of being read while operating the tap changer by hand.

13: With respect to Part II of the Standard, have any new features been added?

Answer: Yes. One addition has to do with future provision for forced cooling. In the new standard such provision now includes the control device with the thermal element mounted in the well and in addition mounting provisions for the control cabinet, conduit, and fans. In the present conventional standard these features are not yet included, but a ballot is currently before ASA which, if passed, will also add these features to Part II of the standard for conventional units.

Several other additions have been made dealing particularly with additional control facilities not usually required by users but which may be incorporated without any substantial modification of the basic unit.

14: Have any of the alternate features previously available in Part II of the standard conventional transformers been eliminated? If so, why?

Answer: While many of the alternate features are still available in the LTC Standard, it has proved desirable to eliminate some of the more elaborate mechanical alternatives. Because of the additional components inherent in LTC equipment, these alternatives could not be included without imposing an excessive cost penalty on the basic standard as covered by Part I.

Included in the list of such items were:

a. Various series-multiple provisions.

b. Terminal boards for Y-delta connection.

c. Terminal boards to provide both standard and non-standard phase displacement. For situations where non-standard phase displacement is required, this is provided by a permanent connection rather than by terminal board.

15: Do you believe that the new standard will have any impact on larger LTC equipments than these covered by the voltage and kva limits of this standard?

Answer: Yes. While the larger kva and higher voltage LTC transformers often require somewhat different switching mechanisms from ones covered by this standard, many of the control features including such items as the parallel operation provision will be equally applicable to larger sizes. Many of the other detail specifications can be used as is or with easily determined modifications in the preparation of future standards or purchase specifications.

A Special Report:

Distribution Design Cuts Tree Trouble

LEONARD M. OLMSTED, Associate Editor

Recent years have brought new vigor to the attitude of electric utilities toward trees. Recognition of the cost of trimming them today and the inevitable rise assured by nature's perseverance and man's continued planting has brought sweeping reforms. Progressive utilities now engineer their distribution for better reliability at reasonable cost despite the trees. Their methods include:

1. Training tree crews to trim more effectively and stimulating public acceptance of their work.

2. Designing new lines and rebuilds to minimize tree trouble by using higher poles or cable where added investment can be justified.

3. Investigating tree species and promoting planting of those which provide satisfying appearance without future interference.

Electrical World has found all these methods in use on many systems. Selected examples are presented in this Special Report.

THE PROBLEM

- Tree Clearance Is Major Obstacle to Distribution Service..... page 74.
- Train Crews for Tree Work..... page 78.

TODAY'S SOLUTIONS

- Aerial Cable and Tree Wire Help Lick Tough Tree Problems..... page 80.
- Cable Gets Primaries Thru Trees..... page 83.
- Hurricanes Spur Storm Proofing..... page 84.
- Distribution Line Design Minimizes Exposure to Trees..... page 86.

THE FUTURE

- Small, Attractive Species Offer Relief from Trimming..... page 88.
- Planned Planting Program Promotes Better Shade Trees..... page 90.
- Utility Test-Plants Low Trees..... page 92

Tree Clearance Is a Major

Promoters plant shade trees . . .

to beautify subdivision streets . . .

- **Aim is best tree clearing at least cost**
- **System survey reveals millions to trim**
- **Solution sought in complete program**
- **Mechanization saves 35–40% per tree**

L. E. LOCKWOOD, Supervisor Distribution Operating,
R. E. JONES, General Supervisor Line Clearance, Commonwealth Edison Co, Chicago Ill.

Several years ago Commonwealth Edison Co recognized the fact that more attention must be paid to the relationship between overhead lines and trees. A study was made of the suburban Chicago area where 25 to 30% of service interruptions were caused by trees. Line clearance cost was climbing steadily because of increasing exposure and tree planting by customers.

Result of the study was a comprehensive program developed to get the best service continuity at minimum overall cost. Steps in the program included:

1. Employing graduate foresters to assist tree clearance crews and design and operating engineers with the tree problem. They were trained in line clearing and distribution design by assignments with both groups.

2. Engaging a consulting firm with line-clearance experience.

3. Surveying 30% of all primary circuits of 34.5 kv and below in the service area outside Chicago to evaluate the tree problem.

4. Presenting the problem and some plans for solving it to top engineering and operating personnel at a company-wide conference.

5. Presenting the problem in the divisions for engineering organizations.

6. Reviewing distribution system design for the maximum use of tree-resistant methods that can be justified economically.

7. Preparing a 48-hour (six working days) training course and teaching it to all line clearance crews.

8. Analyzing the cost of tree clearance work carefully to aid in eliminating or curtailing less economical methods.

9. Developing economical crew organizations for each of the different types of tree clearance work.

10. Investigating all types of tools and mechanized equipment for line clearance to make maximum use of such equipment in reducing costs.

Three graduate foresters were employed and then four more. Each man spent 12 to 18 months in the operating department working with the newly formed tree-trimming crews as groundmen and tree trimmers. Thus the foresters became familiar with all methods of line clearance. They then spent 2½ years in various engineering departments directly associated with overhead line layout, design, and all other phases of field engineering with particular emphasis on tree-line relationships.

Foresters Assume Supervisory Duties

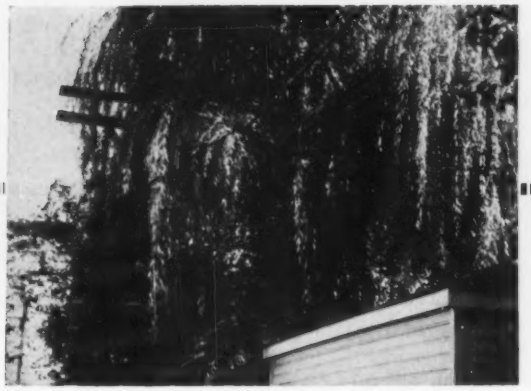
Upon completing the engineering training, the foresters were reassigned to the operating department in an advisory capacity with field supervisory duties. They supervise tree trimming activities and work with engineers on line design when special tree-line conflict problems arise.

In 1952 a line clearance consultant was retained to conduct a field survey to determine the extent of the tree problem. This firm also participated in developing the program to meet the problem.

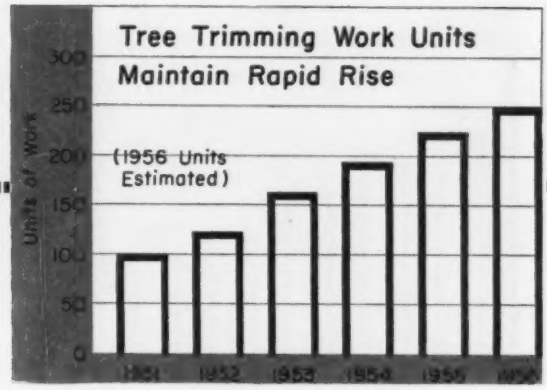
One of the early steps was a field survey of approximately 30% of all overhead lines of 34.5 kv and below. The survey was directed at tree-pole line relationships. Object of the survey was to determine the number of trees in conflict, the most prevalent tree species, and the volume of tree work necessary to attain and preserve adequate and acceptable line clearance.

First step in the survey was examining a cross section of the territory giving attention to lines on public rights-of-way in both urban and rural areas. Transmission lines were not included as most of them are on company-owned rights-of-way where clearances are regularly maintained. Preliminary examination indicated that only nine dominant

Obstacle to Distribution Service



but growth envelops distribution . . .



. . . to boost tree trimming manhours

species of trees were involved. So record keeping could be simplified by recording data pertaining particularly to these species.

The 30% of the system for closer survey was selected by qualified operating personnel. It consisted of examples thought to have average tree-line conflict density. The nine dominant tree species were recorded separately on field inventory data sheets. Other species were recorded in a miscellaneous column. The survey showed that there were 45 different species in conflict with lines and that the nine dominant ones comprised 75 to 80% of total conflicts.

The company foresters collected and tabulated all field data under general supervision of the consulting firm. Data pertaining to each circuit were recorded separately. All trees in conflict were plotted individually on field data sheets indicating species, diameter, type of trimming required, heights of adjacent poles, and required frequency of trimming. Concentrations of brush and the estimated man hours required for eradication were also tabulated.

Survey Evaluates Tree Problem

Projecting data from the survey provided an estimate of the total tree-line conflict problem. This revealed two important elements contributing to the severity of the problem:

1. 35% to 40% of trees in conflict were 5 to 10 in. in diam, indicating rapid crown growth could be expected.

2. 97% of urban and rural distribution pole-line miles are on 25 to 40-ft poles while 80% of the 34.5-kv transmission line miles on public rights-of-way have 35 to 50-ft poles.

These two factors aggravate the tree problem and make relatively short trimming cycles necessary to maintain uninterrupted service.

The required total manhours necessary to maintain trimming on a three-year cycle was established to assist in setting up yearly budgets. And a tree clearance plan was submitted for each division surveyed.

The problem was presented to engineering and operating personnel at an engineering conference in September 1952. Five speakers evaluated:

1. Conditions in the service areas inside and outside Chicago.

2. Tools and equipment newly developed for line clearance work.

3. What can be accomplished through proper engineering.

4. The organization for the proposed tree trimming program.

Another paper covering tree trimming and its effect on public relations was presented at the 1955 conference.

When the program had been formulated, the story was taken to engineers throughout all divisions. It was presented by the head of distribution engineering design from the general office and a representative of the operating department who heads line-clearance activity. The objective of these meetings was to sell engineers on the part they could play by designing tree-resistant lines.

Costs are important in line clearance. Total expenditures are compiled for each year's activities. But the average manhours and dollars per tree trimmed and removed and per acre of brush cut and sprayed are more revealing.

Information of this nature is made available through an intensive method of reporting on operations in the field. Detailed report forms are filled out by all crews.

Annual Reports Chart Progress

Each year the information is condensed and a Line Clearance Activities Report is prepared by each division. These reports show number of trees trimmed and removed for transmission (69 kv and above), primary distribution (below 69 kv), and secondary distribution; total trees handled; percent of total trees removed; acres of brush cut; acres of brush sprayed; manhours charged to various maintenance functions and construction work orders; average cost per manhour; average manhours per tree trimmed and removed; average unit cost per tree trimmed and removed; total hours of travel time; and percent of total hours spent in travel.

Division reports are summarized and costs per manhour

Truck raises man to wires in basket . . .

to trim with power saw and pruner . . .

while cuttings are loaded with chipper . .

are calculated for the company and for individual contractor's crews. The latter comprise 65 to 70% of total line-clearing crews.

Performance of crews using specialized equipment to elevate men into trees is recorded separately for comparison with manual trimming crews. But statistics for the specialized crews are included in the division and company line clearance activities reports.

Analysis of cost data is invaluable in eliminating the more costly and less effective line clearance practices, evaluating new tools, equipment, and methods; and general improvement of line clearance activities.

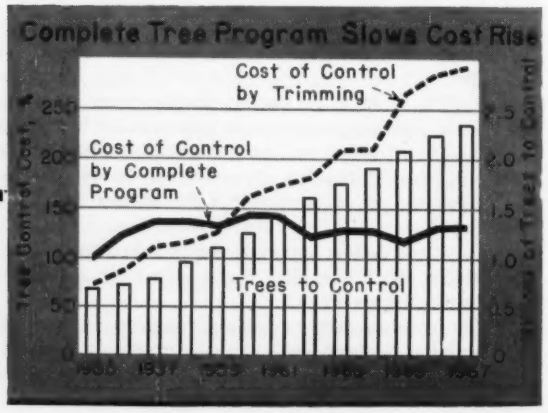
There are four types of crews: manual tree-trimming, mechanized tree trimming, manual brush cutting, and brush spraying.

Along with trimming, tree removal is an integral part of manual crews activities. Conventional methods of climbing with approved ropes and tree-trimming saddles are used. A flat-bed truck provides space for tools, power equipment and for hauling brush or chips.

Mechanization Speeds Trimming, Cuts Cost

Mechanized crews center around a mobile unit used to elevate a man into position to trim trees. Three men and a unit equipped with pneumatic pruners, pneumatic reciprocating and chain saws, a brush chipper and chip container makes a compact and efficient crew. An extra truck to handle chipped brush from heavy sustained trimming keeps the mechanized equipment working. Greater crew efficiency and lower unit costs per tree trimmed are attained in this manner. Tree removal is not a part of the duties of mechanized crews. Line clearance costs are lower with mechanized equipment, but manual crews are more flexible and more adaptable to certain situations and types of trimming.

Right-of-way and roadside brush eradication consists of two phases, cutting and spraying. These methods, plus follow-up spray work for a reasonable period result in complete suppression.



. . . in program to hold tree costs down

Brush cut by one-man circular saw . . .

and trees felled by two-man chain . . .

All programming of brush work and maintenance tree trimming and removal is planned and supervised, insofar as practical, by the tree trimming supervisors, foremen, and field supervisors. The maintenance trimming crews chart their progress and work from standard feeder or circuit maps procured by the supervisor. As field work progresses, the crew leader obtains necessary permits in advance to avoid loss of time.

As an aid in setting up future maintenance programs and estimating manhour and dollar budgets, a perpetual record of trees trimmed or removed and manhours expended for each type of work is kept for each circuit. The man in charge enters this information each day on a record form printed on the back of the feeder map.

Power Tools Contribute Savings

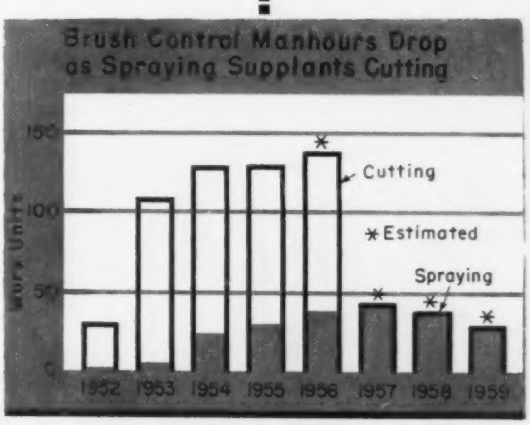
New power tools are effective. The power saw probably has reduced tree-trimming cost as much as any other piece of equipment. Some of the types used are gasoline, electric, pneumatic, and two-man chain saws, reciprocating tree-trimming saws, and circular brush saws. For its application each will do a satisfactory and economical job.

Brush chippers have revolutionized disposal methods and materially cut time required. Outstanding advantages are elimination of unsightly loads; one crew member can handle brush; less space required for chips; fewer trips to disposal area; easier unloading of chips; many uses for chips, such as fill, mulch, roads through parks and forests, and for low grade paper. In rural areas chips can often be blown along road or right-of-way.

The mechanized aerial lift truck is particularly adaptable to urban line clearance but is limited to areas where lines are along streets and alleys. Greatest efficiency is obtained where tree densities are high and side or under-trimming is sufficient. Small trees can be topped economically but not large mature ones.

Records shows that the most efficient mechanized units on the system trimmed trees in 1955 for an overall average of approximately 35 to 40% less per tree than crews using ropes. This is based on costs for labor, transportation, tools, and equipment. To attain these low costs, the entire field operation must be carefully supervised and planned. Particular consideration must be given to work location, travel time, and type of trimming.

have stumps killed by spraying . . .



. . . to head off costly regrowth

Train Crews for Tree Work

Class teaches use of leaves . . .

and bark to identify trees . . .

and knots to use for safe trimming

- Course is tailor-made to do specific job
- Seven instructors picked from supervisory and forester group trained to teach men
- 100 members of trimming crews attend classes in tree identification, work methods
- Aims: Better care of customers' trees, improved line clearance, service reliability

A. B. LARSEN, Supervisor Construction Training, Commonwealth Edison Co, Chicago, Ill.

As part of Commonwealth Edison's overall line clearance program, special training was given to all personnel of the tree trimming crews. Results have been increased skill and knowledge among personnel, standardized work methods throughout the system, proper treatment of customers' trees, better line clearance, and improved service continuity.

The training took the form of a refresher course for approximately 100 senior tree trimmers and groundmen. It covered trimming and removing trees and the latest information on tree characteristics. Instruction lasted 48 hours, six full days. About 35% was classroom work and 65% field practice. All text material and visual aids, which included flip charts, movies and color slides, were tailor made to fit specific needs.

Seven tree trimming supervisors and foresters were given a 32-hour instructors' course. This covered the fundamentals of instructing and practice in the use of instructor guides, text material, and visual aids. Classes for the field crews were small, mostly five to ten men. They were held in nine headquarter towns all over the system. In some areas classes numbered no more than four; for

Putting sharp chain on power saw . . .

leads to cleaner cutting in the field

these classes less field instruction time was required, and the training period was shortened to five days.

Classes were drilled in the identification of trees and in the use of botanical terms in describing leaves. They were taught how to identify tree species, using the tree finder manual for this purpose. The text book "Trees—How To Know Them" included:

History and use of trees.
Tree structure and growth.
Disease and death of trees.

Men also received instruction in work practices. The text for this part of the course, "Line Clearance Methods," covered:

Regulations and policies relative to tree work.
Trimming trees.
Types of trimming for line clearance.
Tree trimming and tree removal methods.
Brush control and disposal.
Use and care of tools and equipment.

New men were taught how to tie the best knots for different types of tree work and were given field instruction and practice in making ties. There was practice in all types of climbing with ropes, using the foot lock, and other specialties of trees trimmers.

Instruction was given in power and hand tools. Men were given practice in the field with all the tools in the "tree trimmer's kit." Field practice was under the guidance of an experienced tree trimmer, the instructor, or sometimes both.

Special attention was given to the felling of limbs and trees in the vicinity of buildings, lines, or other obstructions. Fictitious obstructions were assumed in the field for practice purposes. Classes were also taught the tree trimming fundamental of making a flush cut.

Instructors' outlines for conference and demonstrations were developed so that each instructor would be following the same teaching plan. Training schedules were made to show the time that should be devoted to each subject. Notations for reference material and the method of instruction were included.

Four quizzes of the true or false type were given in the course. Three of the quizzes had ten questions each. The final examination had 24 questions. Through these examinations the men as well as the instructors were able to determine how much useful training they were getting from the course.

Trainees climb with ropes, use tools . . .

to make flush cuts in approved manner

In areas such as these . . .

Aerial Cable and Tree Wire Help Lick Tough Tree Problems

- PSE&G Co has had only 0.114 failures per mile-year with primary 4-kv aerial cable during ten year program of expanding use
- Has several new types of cable on trial for possible future use

G. E. DEAN, Distribution Engineer,
G. A. EWALD, Distribution Plant Engineer, Public Service Electric & Gas Co, Newark, N. J.

Realizing that tree trimming is not the complete answer to the problem of providing reliable distribution service Public Service Electric & Gas Co has always supplemented tree trimming with special conductor practices. For 4-kv primary distribution circuits these practices include:

1. Tree wire.

2. Aerial cable—single and three phase.

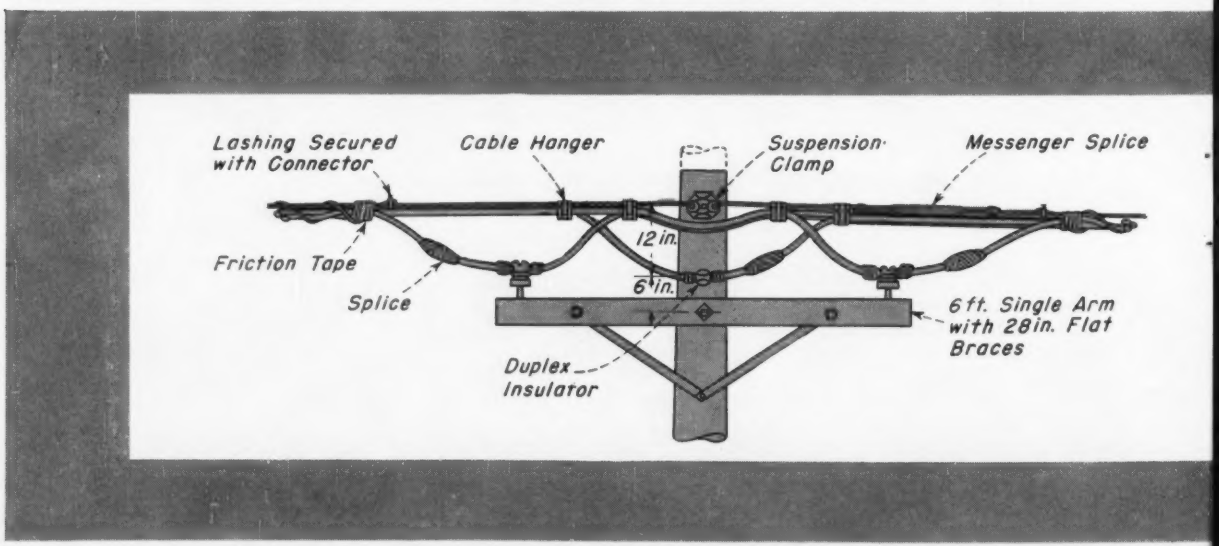
Under consideration for possible future use are:

1. Spacer-type aerial cable.

2. High-strength tree wire as a replacement for single-phase aerial cable.

In recent years the company has used a rubber-in-

SPLICES CAN BE MADE BY LINEMEN on primary aerial cable because slack of reverse lay gives working clearance



sulated, Neoprene-jacketed tree wire. Results have been excellent.

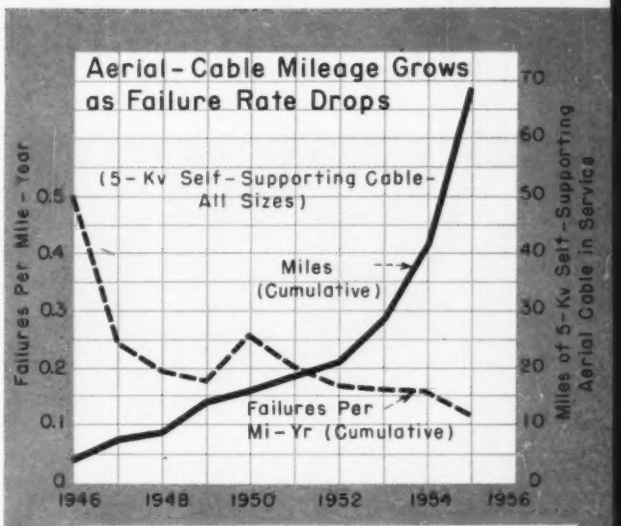
This practice was begun 10 years ago following 30 years use of an older type in which an oil-base rubber insulation was covered with loom. This older tree wire had a near perfect recorded except for occasional burn downs caused by concentration of leakage current under wooden protectors where moisture accumulated. The Neoprene-jacketed wire is more vulnerable to abrasion but improved performance proves more cases of wires down in trees are caused by burning down than by direct rubbing.

Both the new and old tree wire are used on standard cross arm construction with wooden or plastic protectors to circumvent abrasion from tree contact.

With such success it might be pertinent to ask, "Why aerial cable?" Despite its higher cost (see box) the desire to give even better service brought aerial cable into the picture. In addition use of this type of construction reduces tree trimming.

Aside from its value in relation to the tree problem it gives better pole top appearance (a definite public relations asset) and permits more circuits on a pole line. Up to four aerial-cable circuits can be placed on a pole line which could accommodate only two open-wire circuits. Aerial cable is particularly useful for substation outlets where it offers substantial savings by eliminating expensive conduit and manhole construction. It is also used, mostly in the small sizes, to extend service to industrial customers or customers supplied by a back-yard pole line where the line must be run through a narrow or confined space.

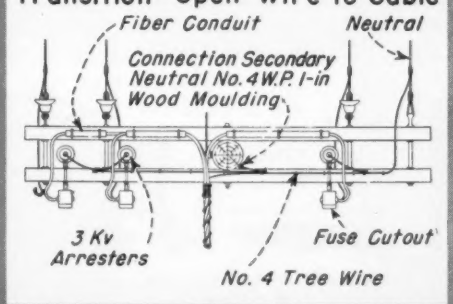
Public Service uses the reverse-lay type of aerial cable because with this configuration taps and splices can be made while the cable is energized. When taps are made the slack provided in "reverse lay" construction permits spreading conductors on standard distribution insulators mounted on pole brackets or across arm. Insulation is then removed from the conductor and the tap made. Splices are made in somewhat similar manner by taking advantage of clearance provided in the 'reverse lay". Splices and taps are left separated from the assembly and the taping is not



Failure Rates of 5-kv Self-Supporting Aerial Cable—1946-55

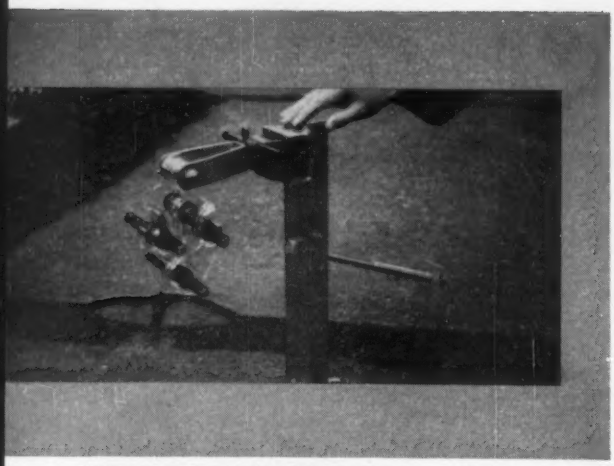
Cable Size	Cable Miles	Mile Years	Mfg Defect	Faulty Instal	Lgtn'g	Inter-ference	Un-known	Failures /mi-yr
No. 4 1/c	21.46	83.71	5	..	1	5	..	0.131
No. 4 3/c	20.60	34.01	..	3	..	..	2	0.147
2/0-3/c	9.84	26.01	1	..	..	..	..	0.038
4/0-3/c	4.47	29.45	..	1	..	..	..	0.034
350 MCM 3/c	8.50	13.42	..	2	..	..	..	0.149
500 MCM 3/c	2.21	4.69	..	1	..	..	..	0.213
750 MCM 3/c	0.47	1.36	..	..	1	..	..	0.735
Total	67.55	192.65	6	7	2	5	2	0.114

Transition—Open Wire to Cable

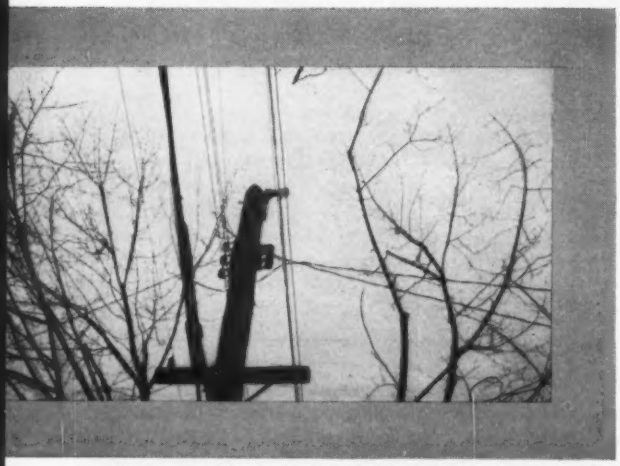


What does it cost to install primary aerial cable or tree wire?

Type of Construction	Relative Total Cost (material plus labor)
Aerial Cable—new construction	200%
Tree wire—new construction	140%
Weather-proof—new construction	100%
Replace weather-proof or tree wire with aerial cable	160%
Replace weather-proof wire with tree wire	125%
Replace weather-proof wire with weather proof	80%



SUPPORT FOR SPACER-TYPE CABLE is attached to the pole with belt and lag. Neutral wire is at top of configuration



EXPERIENCE WITH 4-KV SPACER-TYPE CABLE is confined to only two short primary sections in bad tree territory

required to meet voltage breakdown specifications. Thus an overhead gang can make the complete installation.

Shielding is not used on the cable so that it can be worked hot. The unidirectional lay type of cable is used in locations where no future taps are contemplated.

Field spinning of aerial cable does not seem feasible in this service area because of the many trees and service drops. But it would be given consideration in locations such as new back lot residential construction.

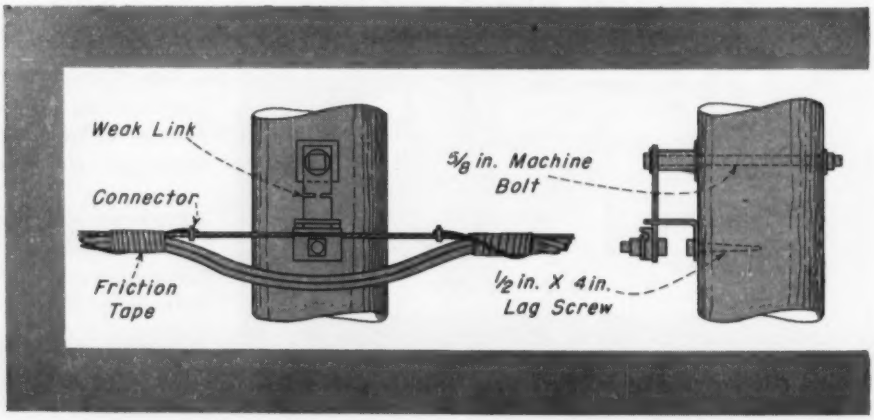
At present aerial cable is being used for both new construction and replacement. In new construction it is used where obvious inspection and mature judgment indicate that tree conditions present or will present excessive hazards to service. Outage records give even stronger indications of where aerial cable should be used in the replacement program. In the past few years a large amount of the older (loom covered) tree wire has been replaced by aerial cable.

About 20% of the aerial cable purchased in recent years has been single-phase cable. However because the three-phase portion of a circuit affects service to more customers, both the replacement and new construction programs have concentrated on the installation of three-phase rather than single-phase cable.

Experience with spacer-type construction cable is limited to two ½ mile trial installations. Both of these short primary lines are operated at 4 kv and located in areas of bad tree exposure. A decision on their worth and possible use in relation to tree wire and aerial cable must await further operating experience and equipment tests.

No unusual difficulties were encountered in their installation. Spacer type cable may be considered for backyard construction where three phase primary distribution is involved. Cross arms could thus be avoided and cleaner poles would result.

The other type of construction under trial and being considered for extended future use is high-strength tree wire. It is a seven strand copper-copperweld conductor with rubber insulation and Neoprene jacket. This type of tree wire may replace single-phase aerial cable where a primary neutral conductor is not necessary because of the presence of a common neutral in the secondary rack position. Considerable saving in cost should result from elimination of one conductor while still retaining the fundamental objective of having something like a high-strength guard wire at pole top.



WEAK LINK detaches cable before pole breaks from trees falling on cable. Weak link is not used where cable crosses streets or railroad

Cable Gets Primaries Thru Trees

FRED W. CARROLL, Assistant General Line Foreman, Heavy Construction Division, Cleveland Electric Illuminating Co, Cleveland, Ohio

Faced with the necessity of maintaining open-wire distribution in heavily-treed areas, Cleveland Electric Illuminating Co has turned to aerial cable as the best way to avoid conductor failures. Cable offers the dual advantage of compact configuration which can pass through small openings and insulation capable of withstanding occasional tree contacts.

Aerial cable installations on 4.34 and 4.8-kv primary circuits during the past year have been of the spacer type. The cable comprises three No. 6 solid soft-drawn copper conductors insulated with ⅛ in. of heat sealed vinyl insulation supported from a ⅜-in. Copperweld messenger with spacer clamps at 30-ft intervals. These insulating plastic clamps are locked to the messenger and the phase conductors with Neoprene bushings to maintain 3-in. space between phases and 3¾ in. between phases and messenger.

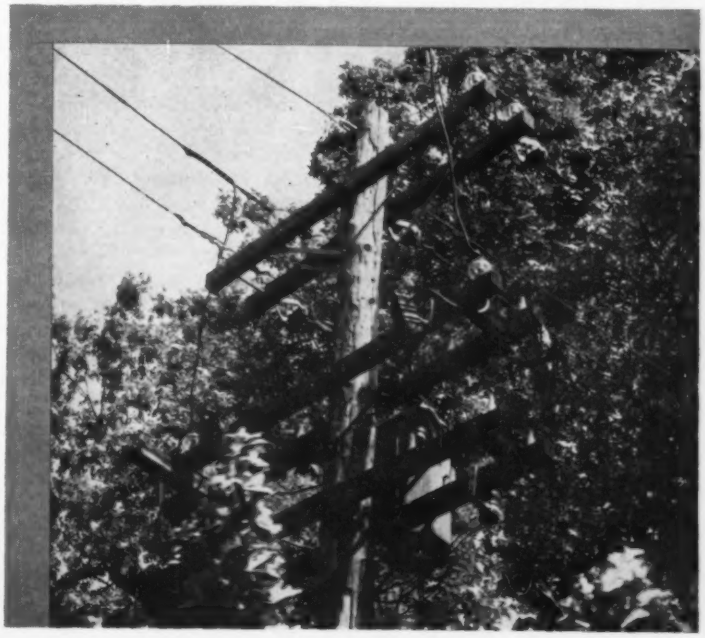
Four lengths of this cable have been installed on primary branches passing through dense trees. Total length is 700 circuit ft. Service time has been too short to provide significant operating experience, but one section has demonstrated ability to withstand a falling limb without visible damage.

Taps Made Easily

Construction is speeded by installing the assembled messenger and conductors in one operation. Omitting the Neoprene bushings from the conductors facilitates sagging messenger and conductors to 8 in. for a 150-ft span. After the strain has been taken up on deadends, the bushings are slipped in place easily from the platform of a tower truck. Where the truck cannot be used, as on rear lot lines, a ladder is used to place the bushings, or a lineman rides the messenger in a cable car.

Taps for distribution transformers or primary laterals are made easily. The practice is simply to cut through the insulation and join the conductors with a split-bolt connector. Insula-

SPACER-TYPE PRIMARY CABLE attaches to top of transformer pole in trees. Insets show attachment saddle for messenger and plastic spacer for cable



AERIAL CABLE starts at transformer pole where open-wire construction ends and passes through trees to right. Installation has usual arresters, cutouts

Cable Thru Trees

(Continued)

tion is then restored by wrapping on adhesive-coated vinyl tape until the covering matches the thickness of the original insulation. For protection during this operation, linemen cover the conductors and messenger with rubber hose and blankets, as is customary in "hot" work on open-wire conductors. Water seals or stress cones are not needed.

Records show that aerial cable costs more per circuit ft installed than conventional open-wire construction. Yet savings in tree-clearance expenditures during installation and annually thereafter offset much of the difference. If longer experience confirms expectations, aerial cable of this type will be used extensively to get primary circuits through dense trees.

CABLE ATTACHMENT at corner pole is by insulated clevises for phase wires, pole attachment for messenger. Configuration is suited to a narrow opening

Hurricanes Spur Storm-Proofing

Wide-spread hurricane damage in the Eastern Seaboard States in the past several years has stressed for electric utilities the desirability of storm-proofing overhead transmission and distribution circuits. Such storm-proofing is all the more important because of the increasing dependence of customers on uninterrupted service for maintaining post-World War II standards of living.

Today more people cook electrically, and practically all homes have heating installations dependent on electric power for control or circulation of heat. Suburban water supply and sanitary facilities rely on electricity. Protracted service interruptions affect the farmer's milking machine, milk coolers, chicken brooders, incubators, and water pumps.

Operating in a heavy loading area with regard to the strength of pole plant required by the National Electric Safety Code, Niagara Mohawk Power Corp is subject to outages from the effects of sleet, wind, lightning, and trees. Assured continuity of service might be realized from pole lines of adequate strength on rights-of-way completely free of trees, from all-underground construction, or from all-aerial cable construction.

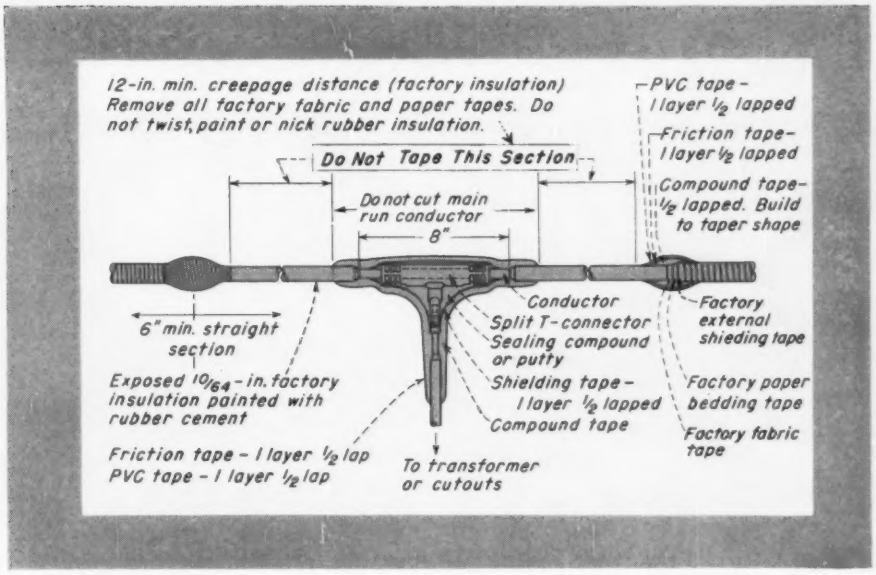
But obviously, it would be impractical to consider obtaining rights-of-way, especially for distribution circuits, completely free of trees. In considering all-underground or all-aerial cable circuits, economy is the controlling factor. Someone must pay for such refinements, and the company's only source of income is the ultimate consumer. Consumers want high quality service, yet cannot bring themselves to pay for it. Consequently, in view of the magnitude of the existing plant, any storm-proofing scheme is necessarily a compromise and a rather long-range plan.

Storm-proofing Cuts Interruptions

Effective storm-proofing reduces the number of failures, the length of interruptions, and the number of customers affected by each failure. Failures can be reduced by one or more of these methods:

1. Improving tree clearance by removal or trimming.
2. Rerouting existing circuits to avoid trees.
3. Replacing poles of inadequate height.
4. Above-ground pole treatment.
5. Re-designing sub-transmission pole tops for higher impulse value.
6. Increasing the spacing of primary conductors. (Often this can be done by converting street lighting from series to multiple, or using common neutrals on star-connected systems.)
7. Replacing defective ground wire on transmission.
8. Replacing obsolete insulators.
9. Replacing inadequate switchgear.
10. Installing sleet-melting equipment.
11. Installing aerial cable where tree clearance cannot be otherwise obtained.
12. Converting from overhead to underground.

The length of distribution interruptions may be reduced


12-in. min. creepage distance (factory insulation)
Remove all factory fabric and paper tapes. Do not twist, paint or nick rubber insulation.
PVC tape – 1 layer ½ lapped
Friction tape – 1 layer ½ lapped
Do Not Tape This Section
Compound tape – ½ lapped. Build to taper shape
Do not cut main run conductor
8"
Conductor
Split T-connector
Sealing compound or putty
Shielding tape – 1 layer ½ lapped
Compound tape
Factory external shieding tape
Factory paper bedding tape
Factory fabric tape
6" min. straight section
Exposed 10/64-in. factory insulation painted with rubber cement
Friction tape – 1 layer ½ lap
PVC tape – 1 layer ½ lap
To transformer or cutouts

TAP requires cutting back and terminating external shielding tape and bedding to expose rubber of cable main, then taping joint.

by one or more of the following methods:

1. Converting sub-transmission from a radial to a loop or double-circuit system.

2. Installing supervisory control and sectionalizing on the transmission and sub-transmission system.

3. Providing additional sources of sub-transmission.

4. Reinforcing distribution system ties.

Customers affected by an interruption may be reduced by breaking up "tee" feeders, thus reducing the customers controlled by one breaker; or by sectionalizing distribution circuits, utilizing reclosers.

Aerial Cable Supplants Open Wire

Aerial cable cable costs about twice as much as open-wire construction. Niagara Mohawk uses it only when the following methods prove insufficient:

1. Tree removals.

2. Tree trimming.

3. Increasing spacing of primary conductors by conversion to common neutral on star system; or, conversion to multiple street lighting, replacement of existing wire with conductor of higher tensile strength; or, rerouting the line.

Niagara Mohawk has used aerial cable on systems below 5 kv in some localities for more than 20 years. One installation in the Western Division operates at 23 kv. For distribution applications, the company has standardized on No. 2 and 4/0 copper equivalent conductor with a 10/64-in. wall of ozone-resistant compound and 5-mil ambrac or equivalent shielding tape.

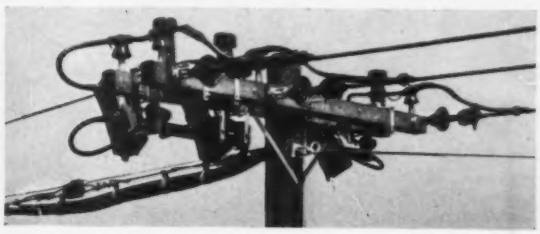
Compared with open wire, aerial cable has few outages caused by faults, yet the few are more prolonged. Accordingly, Niagara Mohawk has suitable sectionalizing at 1,500 to 2,000-ft intervals.

Aerial cable is preferred for "express" feeders, those extending from a substation to a specific load area. Such applications involve a minimum of joints, a probable source of trouble. But there are applications economically justified for sections of local distribution where transformers must be accommodated. There the company attempts to anticipate its future needs in transformer locations, so that the original installation can meet those needs. Thus interruptions of the cable circuit at a later date can be avoided. The company has given much thought to tapping cable circuits to accommodate transformer installations, considering both reliability and the appearance of the installations.

The experience of other electric and communication companies has helped to guide Niagara Mohawk's aerial cable installations to fit varied field requirements.

90-DEG TURN is made from one highway to another where radius of intersection, trees, etc., would not permit a pole

AERIAL CABLE (left) is connected to open-wire primaries (right), protected by lightning arresters, through cutouts



Coordinated Distribution Line

Avoid trees using clear side of road . . .

or setting back on private property . . .

• $1,000 investment is justified if it will eliminate $150 per year tree trimming cost
• Several design measures are used singly or in combination to cut trimming need

M. S. WATSON, Engineer, Distribution Engineering Dept, Commonwealth Edison Co, Chicago, Ill.

System design plays an important part in Commonwealth Edison's long range tree plan. Engineers design distribution system reinforcements as well as new extensions in a manner that will avoid to the maximum extent recurring trimming costs and interruptions due to trees. They know that an additional investment of $1,000 is justified to eliminate an annual tree trimming cost of $150. Where tree trimming will cost as much as 15% per year of the additional investment which would be required for permanent relief, tree-proof design is followed.

Design measures applied to minimize tree trimming costs are:

1. Removing objectionable trees before the line is built.
2. Setting poles back from the highway line to keep wires out of trees.
3. Putting side arms on poles to run wires around trees.
4. Using high poles to raise wires over trees provided they will maintain clearance when the trees reach their probable ultimate height.
5. Mounting open-wire secondaries vertically on the poles to provide better clearance from trees.
6. Stringing high-strength wire with tree-wire insulation where trees overhang and subject wires to falling limbs.
7. Using aerial cable for primaries, secondaries, or both.
8. Using buried cable where tree conditions justify the investment and less costly methods will not suffice. Cable is buried in narrow trenches without ducts. Transformers

Trim lightly and use tree-wire primary . . .

supplemented by aerial-cable secondaries

Design Minimizes Exposure to Trees

or side-arming line on higher poles . . .

or building above trees' mature height

fed by buried cable may be semi-buried and concealed by landscape planting.

The design solution for each tree problem is based upon the conditions that prevail. If more than one of several possible solutions will do the job, then the advantages and disadvantages of each are weighed. In such cases relative costs are frequently the determining factor.

For example, it is estimated that buried cable costs two to three times as much as aerial cable for comparable lengths if the lines are reasonably straight. But curved or winding streets or easements boost considerably the cost of anchoring or supporting aerial cable against side strain. Aerial cable is estimated to cost 1½ to 2½ times as much as open-wire construction, in selecting solutions for comparison.

Newly-designed vertical construction for secondaries uses the more natural vertical clearance for passing through trees rather than horizontal clearance which requires excessive cutting. It also provides ample climbing space, even where several services are involved, and affords a safe standing arm when the neutral is covered with rubber hose.

When engineers are in doubt as to probable trimming costs or are troubled by unusual or difficult tree problems they call upon company foresters for advice. There is a forester at each division headquarters.

This program has been long in preparation and has been in operation a relatively short time. Indications are that it will bring lower tree trimming costs, a substantial reduction in overall costs, improved service to customers, and better public relations.

It was introduced with talks and colored slides at meetings of engineering groups throughout the area. Cartoons, were used to emphasize the speaker's remarks and to add interest to the meetings.

and primary cable for 3-phase runs . . .

or use buried cable to hidden transformers

Small, Attractive Species Offer

IDAHO LOCUSTS, in new plantings, line a Cleveland, Ohio, street. This species is one recommended for such placement by modern arborists. It grows to a height of 25 ft, has rose pink flowers in June, and sheds a light lacy shade

Arborists, city planners, and utility engineers recommend new replacements for traditional elms, oaks, and maples

M. W. STAPLES, Field Supervisor, Davey Tree Expert Co, Kent, Ohio

The traditional residential street with its rows of elms, oaks, and maples is destined to go the way of the covered bridge. But its passing need not mean a tree-less community in the future. The old trees can be replaced physically, if not in sentiment. And the replacements, according to the modern arborist, though smaller, will be more beautiful perhaps and more colorful certainly.

The automobile makes more spacious roads and streets a prim necessity. Communities today want street lighting that actually illuminates. To establish and maintain adequate standards of living in heavily populated areas, gas and water pipes, sanitary and storm sewers can't be hampered by underground root growth. These separately and together spell the doom of the big trees which are threatened also by their own troubles, the fatal Dutch elm disease and phloem necrosis.

But by all odds the most immediate threat to these trees is the people's dependence today on electric energy. They want continuous and adequate current for heating and cooling their homes, refrigerating and freezing food, cooking meals, washing and drying clothes, cleaning the home, and furnishing entertainment. Electricity furnishes light and power to industry and commerce, transports a man and his goods from place to place, enables him to communicate with anyone anywhere at any time.

The only economically feasible means of delivering this vast amount of energy to millions of consumers is by overhead wires following the streets and highways where the consumers live. Underground lines are not an economical alternative in most areas, and the people refuse to pay for them. Even tree maintenance around overhead lines is economically tolerable only for a time.

Forward-thinking utility engineers, city foresters, arborists, lighting engineers, and landscape architects are agreed that the ideal city of the future must be well planted with trees tailored to the needs of each particular situation. Narrow trees to fit narrow streets, wider trees for open parkways, small trees fitting the limited space under utility wires. Some of this has been accomplished in a limited way, and possibilities seem wide in scope.

The most difficult hurdle blocking their path is public opinion. The paramount problem is re-education of the citizen. Public approval is merely the first of a series of hurdles to be overcome by the city planner.

What are the miracle trees that can be so effectively tailored? What type of soil do they need? Are they hardy in this climate and location? Do they bear objectionable seeds or fruit, and will grass grow under their branches? Can they be obtained in sufficient quantity? These are other problems.

Demand has exceeded supply for the past several years even for standard shade trees. But as demand increases, ingenuity will find ways to meet the need. Considered on a one-year or two-year basis, modern type plantings are expensive. On a ten or 20-year basis they are a real bargain, affording more beauty and utility for less money than people are spending now.

Those who regret the passing of the traditional forested street have some compensation in knowing these friendly old trees still have their place on home grounds even though the modern one-story home doesn't need three-story shade trees.

In the usual concept some of these trees are more

Future Relief from Tree Trimming

shrub than tree and would be too low for street use. This can be controlled by the manner in which they are grown. Most small trees and large-growing shrubs can be pruned and staked to produce "standards" that have clear trunks to any desired height. Many smaller species have lovely flowers, bright fruits, or colored foliage.

All the trees listed here have faults and require some care and maintenance. Final choice for any particular location must be subject to a study of the needs, conditions, soils, traffic, and space. But any one of them would be cheaper to maintain, remove, or replace than the forest giants so dear to many communities. Their judicious use would add to the aesthetic and real value of any street, old or new.

Some of the trees suggested in the list below are selected clons of long familiar trees obtained by asexual propagation of natural mutations. Some are little known introductions from other lands, and some are the results of the plant breeders' skill. Included are a few trees that grow to large size in their proper latitude, but grow very slowly when planted near the northern limit of hardiness and are considered as small or medium trees.

Trees Recommended

Name	Height-Ft	Characteristics
Column Norway Maple	50	Good for narrow streets. Too tall under wires.
Cleveland Norway Maple	35	Upright oval form, medium size.
Globe Norway Maple	25	Dense, round headed, formal.
Column Red Maple	60	Dense upright form. Too tall under wires.
Tilford Red Maple	30	Semi-dwarf globe. Quite formal.
Sentry Sugar Maple	50	Upright form of sugar maple. Dense, slow growing.
Ruby Red Horsechestnut	30	Nice little tree with outstanding blossoms. Foliage a bit coarse. Some clons sterile.
Pyramid European Hornbeam	35	Excellent compact upright form. Good foliage texture. Formal.
Katsuratree	35	Female widespreading; male narrower. Handsome foliage.
White Fringetree	25	Often shrubby, especially in north but can be grown as a "standard." A handsome flowering tree.
LaValle Hawthorn	25	White flowers in spring, good foliage and red to orange fruits.
Pauls Scarlet Hawthorn	25	Masses of scarlet blossoms in June. Somewhat slow growing.
Washington Hawthorn	25	White flowers in June; orange to scarlet fall color, plus red berries all winter. Bird food.
Korean Evodia	25	Beautiful little tree, covered with small white flower clusters in August.
Flowering Ash	35	Favorite tree in southern Europe. Fragrant in bloom.
Thornless Honeylocust	40 to 70	Selected clons of native honeylocust. Mostly too large for street trees but semi-dwarf forms are on the way.
Panicled Goldenraintree	30	Beautiful yellow blossoms in early summer. Not quite hardy in colder regions.
Sentry Ginkgo	50	Upright form of common ginkgo. Plant male trees only.
Caster Aralia	35	Too large in southern states but smaller in the north. Needs room to spread.
Scotch Laburnum	25	Clusters of yellow flowers in May or June. Casts light shade. Hardy to Detroit and Buffalo.
Hopa Crabapple	18	Red flowering crabapple. Hardy, tolerant, beautiful.
Eley Purple Crabapple	18	Popular variety with bright pink flowers, colored foliage, dark red fruit.
Column Cherry Crabapple	18	Tall, narrow in form. White flowers, small fruit.
American Hophornbeam	35	Native tree. Hardy throughout. Rather slow growing.
Chinese Corktree	40	Tolerant of city conditions. Needs room to spread.
Callery Pear	30	Symmetrical little trees, white blossoms in early spring. Fruit small, not edible.
Willow Oak	60	Too large in southern states but smaller in cold regions. Fine foliage. Dense.
Idaho Locust	25	Rose pink flowers in June. Light lacy shade.
Umbrella Locust	20	Formal gloves for limited space.
Japanese Pagodatree	30	Covered with white flowers in August. Stands city conditions. Needs room to spread.
Littleleaf Linden	50	Beautiful tree. Fragrant. Becomes rather large but grows slowly.

Planned Planting Program

Landscape architect's plan is accepted by residents who will own and maintain trees

- **Demonstration in new residential area initiates program of selective planting**
- **Portland GE donates trees and material which nurserymen place without charge**

Portland General Electric Co recently completed a planned tree-planting demonstration in a new residential district in Portland, Ore. The demonstration was an experimental phase of a long-range tree control policy aimed at maintaining adequate distribution line clearance.

The demonstration planting was a cooperative effort among the residents of the Menlo Park home development, the Oregon Association of Nurserymen, and the Portland electric utility. Some 225 young trees, representing a wide variety of suitable shade trees, were given to the homeowners by the company and planted by members of the nurserymen's association.

The utility believes that this program will establish good public relations with company customers and simultaneously maintain adequate line clearance.

Company records indicate that 75% of the cost of repairing stems from line outages caused by trees. It was decided that immediate progress could be made toward reducing these line outages by initiating planned planting of suitable shade trees in new residential areas.

Records showed that scores of forest giant saplings were being planted monthly under and near company distribution lines and service drops. This could result only in constantly increasing labor and material costs for repairing future line outages. One of the control methods decided upon was the experimental planting program now completed in the Menlo Park residential development.

This particular home development was selected by the company as the experimental site because the area was new and provided ideal conditions for the type of planned tree-planting under discussion.

Permission to inaugurate the program was obtained from property owners through individual solicitation by ten representatives of the area's residents. These representatives had formerly served as commissioners in the development's street lighting district—a lighting program planned and installed by the company—and had cooperated closely with company representatives.

In discussions between the commissioner and PGE, the advisability of protecting the homeowners' investment in the recently installed street lighting program was emphasized. The company pointed out that tall-growing trees would soon obscure the lights.

PGE and the representatives of Menlo Park agreed that some forest-type trees planted previously by a few of the residents would be transplanted and replaced with suitable

Promotes Better Street Trees

shade trees recommended by the company if permission could be obtained from the owners. In each case—whether it involved planting trees in parking strips where no trees existed before or substituting decorative shade trees for forest-type trees—permission was obtained from the individual homeowner by the district's representatives.

The commissioners worked evenings to obtain permission to inaugurate the planting program. When every homeowner had agreed upon the program, the area was staked out according to a professional landscape architect's plan. The name of the tree to be planted was indicated on each stake.

Actual planting of the trees was completed in late February of this year by ten member-firms of the nurserymen's association. The nurserymen donated time and machinery to plant the trees while PGE furnished the trees and materials such as fertilizer, peat moss, and stakes to support the young trees.

Average planting consisted of one tree to approximately 50 ft of house frontage on the parking strip and two trees per lot on streets selected for informal treatment. As many as six to eight trees were planted on some homeowners' properties where the landscape architect had indicated, and none where the householder so requested.

Pink dogwood, flowering cherry, sweet gum, and Japanese cherry were a few of the species planted in PGE's demonstration. Each species was selected on the basis of its slow rate of growth, its compact non-damaging root system, maximum mature height, and aesthetic suitability.

The planned, experimental tree-planting program was initiated with the circulation of a tree planting permit which pointed out the need for such a program and requested the homeowner's signature. This was done over the signatures of the street lighting commissioners.

Accompanying the request for permission to plant was a letter which pointed out the damage done by indiscriminate planting of forest-type trees. The letter listed such damages as cracked sidewalks, clogged drains, electrical outages, and damage to roofs and gutters.

The utility's basic idea in offering the trees, free of charge, was to demonstrate uniform avenue planting on the streets of the area, the letter explained.

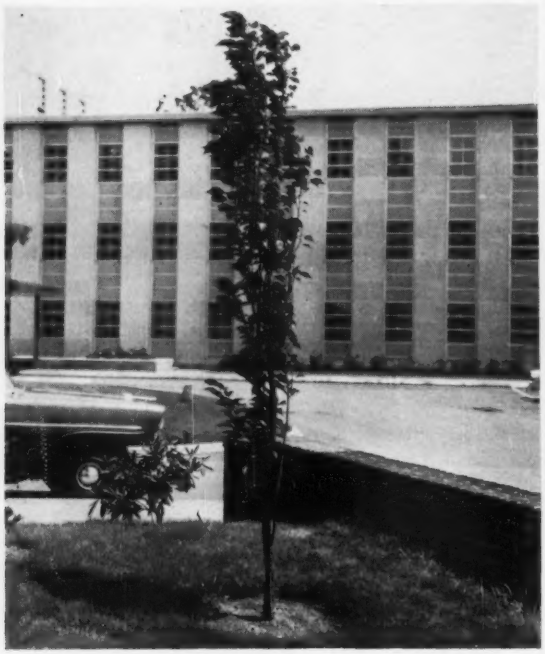
PGE, as of December 1955, maintains approximately 6,400 pole line miles of distribution circuits and 800 pole line miles of transmission circuits. Each year sees continuing growth of the company's service area and the costs of maintaining lines. Numerous new residential home developments have been completed or are under construction throughout PGE's service area.

The company believes that the demonstration planting in the Menlo Park home development is a start in the right direction. If successful, the utility says, the program will probably be expanded as an integral part of a long-range tree-planting program.

PGE feels that cost of the trees furnished to replace objectionable forest-type trees is relatively small when compared to the ever-increasing costs of trimming, spraying, and replacing. In the long run a planned tree planting program will relieve substantially the cost of maintaining adequate line clearance.

Trees are planted by regular nurserymen . . . at locations staked by PGE personnel

Utility Test-Plants Low Trees



JAPANESE CHERRY TREE decorates and gives shade. Even its mature height does not reach the level of conductors

WASHINGTON HAWTHORN also keeps its head down. Like tree at left, it decorates Cabin Hill lawn at Greensburg, Pa

- **West Penn Power uses new headquarters to demonstrate recommended trees to customers**
- **Arboretum will test 25 small varieties**

F. A. ASHBAUGH, Supervisor of Line Maintenance, West Penn Power Co, Greensburg, Pa.

A long-range program to cut tree-trimming costs is under way today at West Penn Power Co. Included in this program will be encouraging customers and municipalities to plant species which do not grow high enough to interfere with electrical conductors. Such trees along the streets would enhance traffic and pedestrian safety by permitting more effective street lighting. And many of them, especially the flowering varieties, would be suitable for landscaping as well.

But more must be known about some of the trees suggested for street and residential planting before they can be recommended unreservedly by an electric utility. Municipal and utility foresters are not yet in agreement as to their suitability. Many questions remain to be resolved.

Recent establishment of its Cabin Hill general office gives West Penn an opportunity to evaluate many low-growing and flowering trees for street use. Such trees have been included in the landscaping and planted along the driveways.

West Penn is also planting its own small arboretum near a main highway where the public, municipal officials, and others may view some 25 species of low-growing trees. Experience here will establish which of these varieties thrives in the climate and soil of Western Pennsylvania.

There are several outstanding examples of the use of low-growing trees for street planting to avoid conflict with utility lies. Probably the most notable is in Cleveland, Ohio, where a considerable start has been made under the direction of Edward Scanlon, former tree commissioner. His philosophy is spreading across the country.

Greater use of low-growing trees can also bring impressive savings in tree maintenance. This is important to many municipalities faced with ultimate removal of forest-type street trees which have passed their maturity. The cycle would only be repeated if these trees are replaced with others of similar growth habits.

The problem is accentuated by today's movement to the suburbs. Frequently new suburbanites plant tall-growing trees because they are easily available. These people, too, must be told the advantages of low-growing trees.

Forest-type trees have been planted along streets and around homes for many years because they survive under poor conditions and make rapid growth. Despite the damage they have caused to sidewalks and sewers and the ugly shapes repeated trimming has produced, replacement will be slow. But adoption of the new tree program will make low-growing trees the rule for streets and highways and leave forest-type trees in the forests.

SUBSTATION—Testing

In-Stock Tests Weed Out Bad Insulators

E. C. RANKIN, Supervising Station Engineer, Appalachian Electric Co, Roanoke, Va.

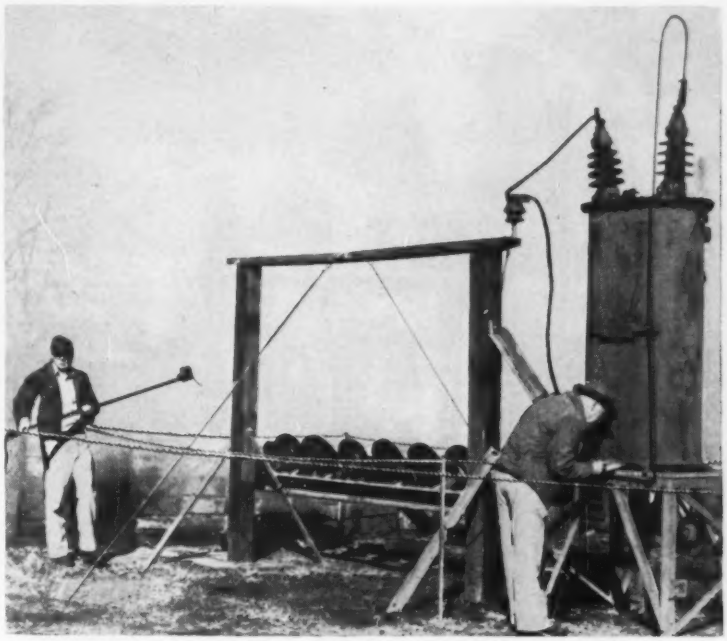
"In-stock" tests and a simple marking scheme enable the System Station Dept. of Appalachian Electric Power Co to weed out bad insulators and distinguish new from old. It has been difficult to ascertain the relative condition of insulators returned to stock after a few months in service. The tests measure voltage distribution across sections of insulators, and ascertain whether the complete insulators will withstand high voltage.

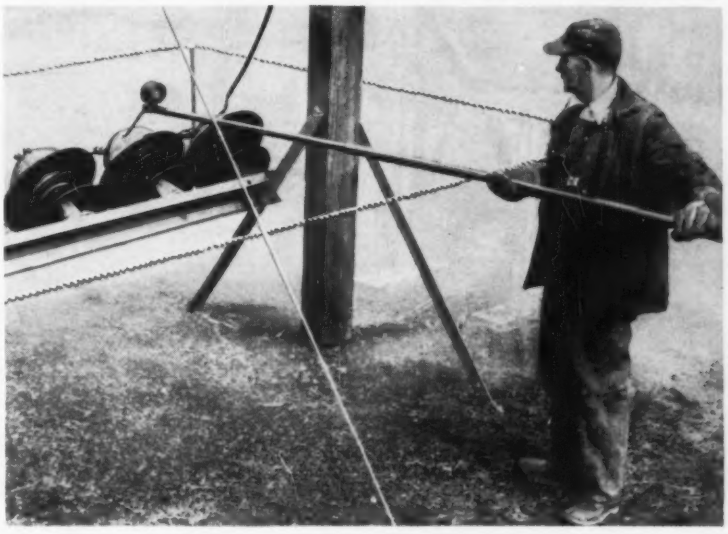
Frees Doble Equipment

Stock insulators could be tested with Doble equipment. But such tests would tie up equipment needed for other tests. Tests of multi-part insulators with a 1,000-v insulation resistance measuring instrument could give a high reading, if one part were good and the others defective. Insulators which test "good" by this method sometimes test "bad" with the high-voltage tester normally used for insulators in service. Yet insulation resistance measurement gives a good test on insulators rejected by the high-voltage test. The latter method is our standard for "in-service" tests and should be used for "in-stock" tests.

Testing Area Enclosed

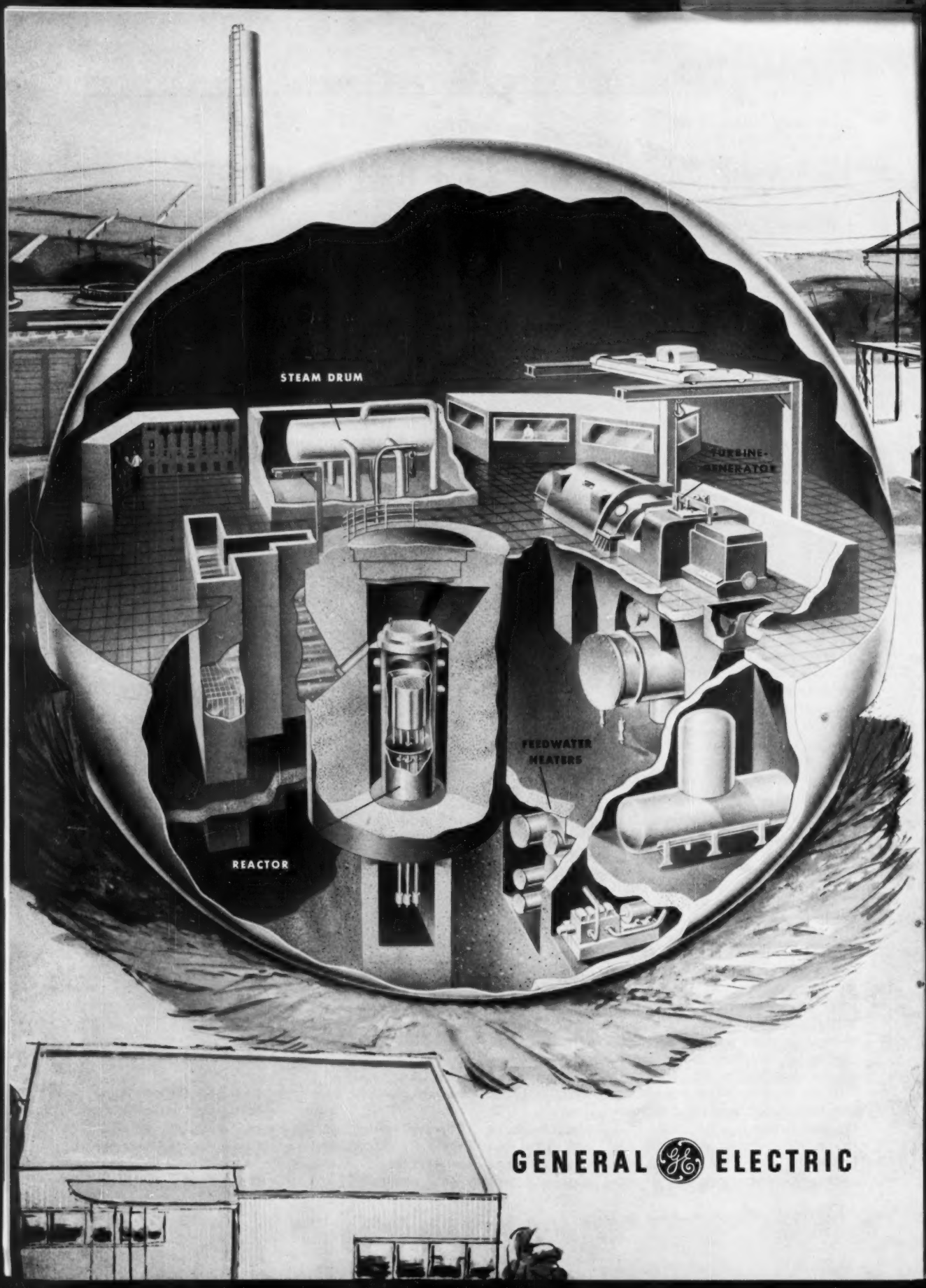
The illustrations show the channel-iron rack for mounting insulators on standard bolts so that they are easily accessible for tests. For safety, the rack and any supporting steel or platforms are solidly connected to the station-ground system and the testing area is enclosed by a waist-high black-and-yellow plastic rope fence. The height and angle of the rack were selected for safety and convenience in reading the instrument on the end of the hot stick held by the tester.





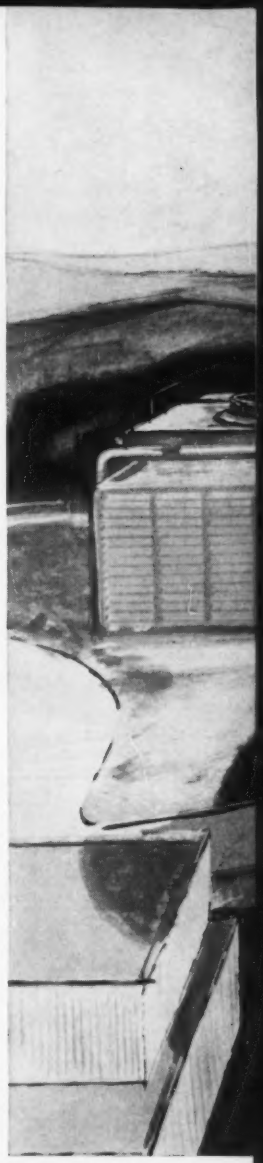
There are other safety precautions. One high-voltage terminal of the testing transformer is solidly connected to the station-ground system. A 30-amp safety switch connects the low-voltage supply and contains a 10-amp fuse that blows when any insulator breaks down; it is considered better than a 5-amp fuse in the high-voltage lead. A red light on the box indicates when the testing transformer is energized. Furthermore, the plug connector between the switch and low-voltage power supply is pulled before anyone goes inside the roped-off inclosure and while changing insulators on the rack.

(*Continued on page* 99)



GENERAL ELECTRIC

General Electric offers new single-cycle BWR* for atomic power plants



Designed specifically to furnish energy for electric power generation

Forerunner of a whole new family of small power reactors, the General Electric single-cycle boiling water reactor is a new source of energy designed for power plants in a range of 5000 to 20,000 kw. It can be modified for larger ratings.

Boiling in the reactor itself and forced circulation offer these advantages:

(1) Simplified design; no main heat exchanger used. **(2)** High thermal efficiency. **(3)** Automatic control of response to load changes. **(4)** Greater safety since reactor is self-limiting in case of excessive nuclear reactivity.

This reactor uses fuel elements of the long-burnup type. Spent fuel elements are stored in the service pool adjacent to the reactor until cool enough for futher handling.

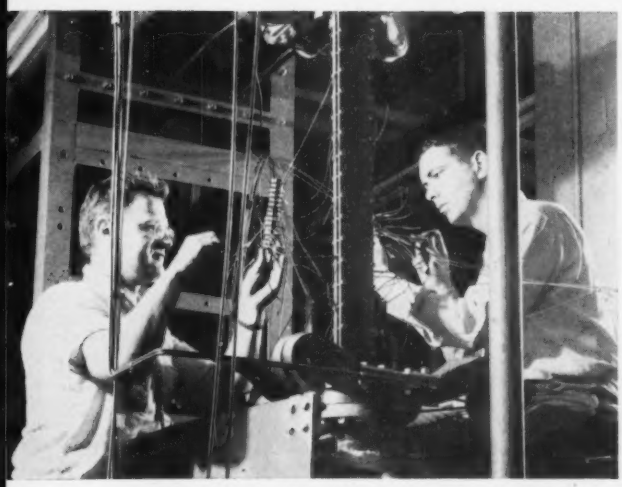
The reactor and service pool can be equipped for neutron and gamma irradiation for research without interfering with reactor operation.

For more information, write for bulletin GER-1220, Sect. 192-7, or contact the Atomic Power Equipment Dept., General Electric Co., Schenectady 5, N. Y.

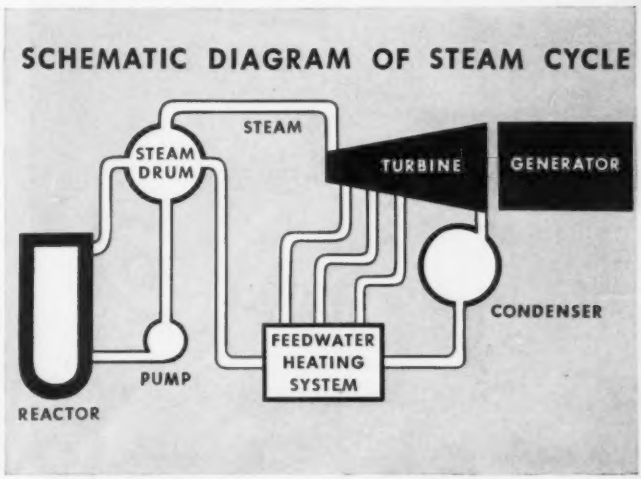
Boiling Water Reactor

Progress Is Our Most Important Product

GENERAL ELECTRIC



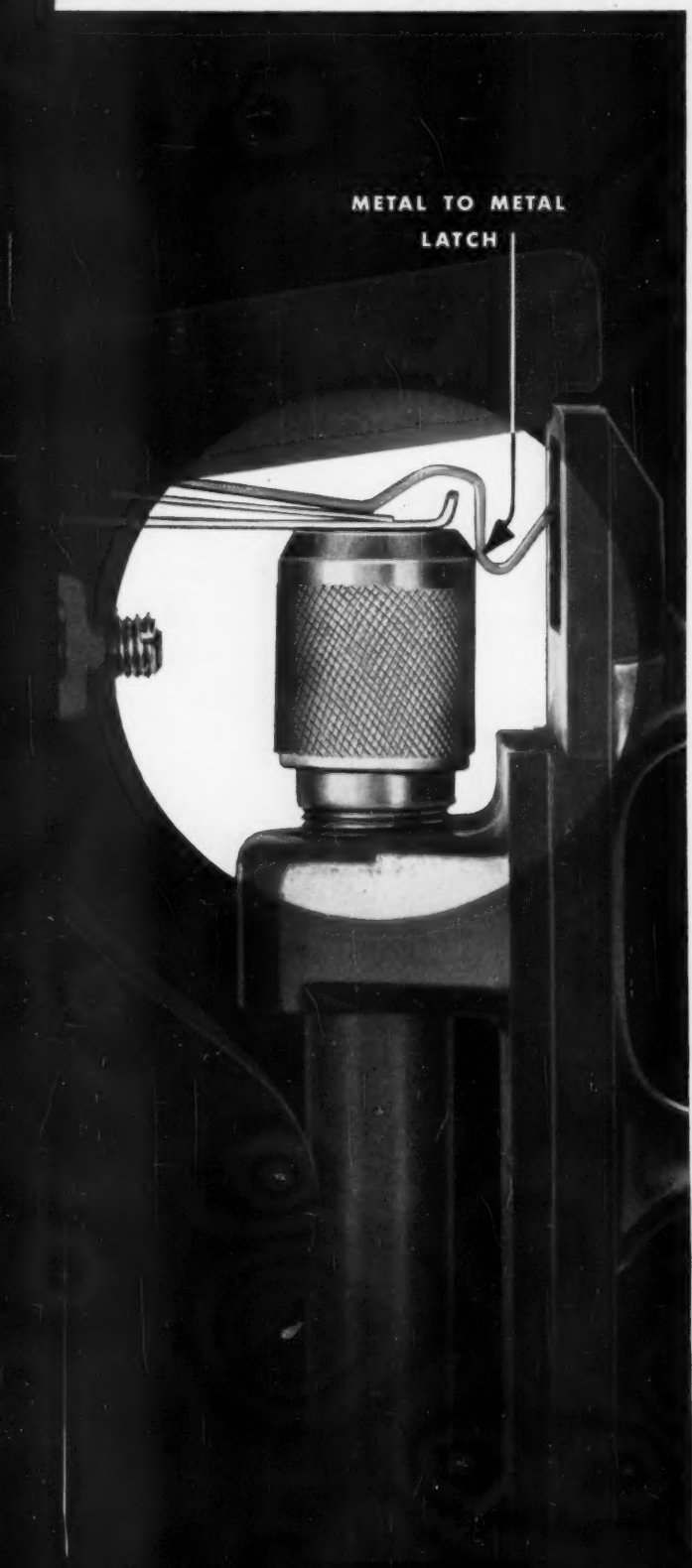
SIMULATED FUEL ELEMENT being installed in a heat transfer loop for tests under reactor thermal conditions. This is one of G.E.'s supporting atomic development programs to advance reactor design.



STEAM FLOWS FROM REACTOR to drum. Saturated steam passes to turbine; water goes to feedwater heaters and returns to steam drum. Forced circulation pump provides automatic control of response to load changes.

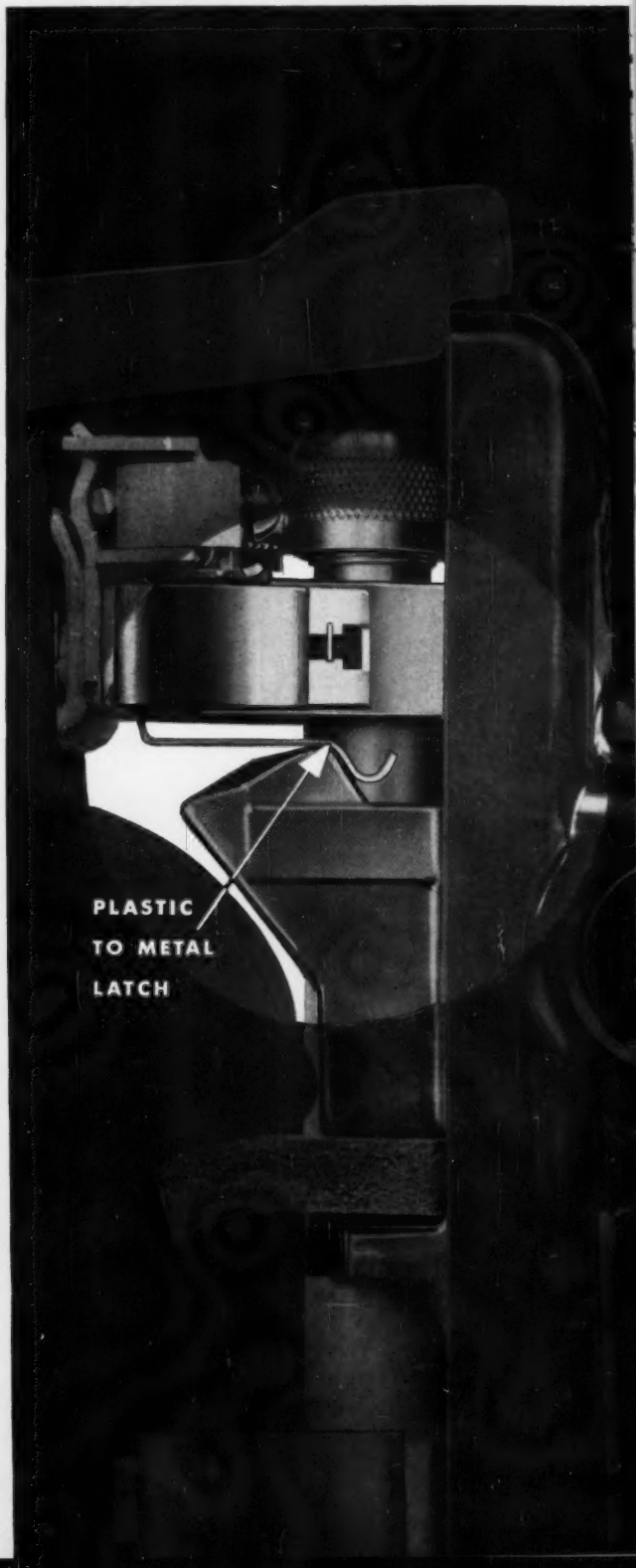
old

Metal-to-metal latching sometimes "seizes" under corrosive conditions. Door may be hard to open.



new

Plastic-to-metal latching eliminates door "seizing" problem. Door opens quicker, easier.



ALL-NEW ENCLOSED FUSE CUTOUTS

now...

Plastic-to-metal door latch assures easier opening prevents door "seizing"

Even after years of service, the doors on all-new G-E enclosed fuse cutouts open easier. Unique plastic-to-metal latching prevents corrosive "seizing" common to metal-to-metal latches. Easier door-opening is assured for drop-out action, switchstick handling, and manual operation.

POSITIVE LATCHING is assured throughout the life of the cutout by latching members of sturdy Textolite* material and long-life stainless steel. Current-carrying parts and latching members are functionally separated and are not required to perform a double duty.

ALL FUNCTIONS IN ONE basic design—G.E.'s new enclosed fuse cutout line gives all functions . . . indicating-dropout, indicating-non-dropout, disconnect—in one basic design. You get two current ratings, 50 and 100 amperes, and two voltage ratings, 5.2 and 7.8 kv, to match every possible system demand.

OTHER OUTSTANDING FEATURES include: the safety-grip door handle, for easier door handling; self-aligning "V"-wedge contacts, that add years to cutout life, and compression-clamped hanger supports, that withstand the roughest shocks. For a complete description of the new cutout line, write for bulletin GEA-6208, General Electric Company, Sec. 433-15, Schenectady 5, N. Y.

*Registered Trademark General Electric Co.

ENGINEERS AND LINEMEN AGREE

The completely new line of G-E fuse cutouts has more of the features they prefer. There's good reason, too—the new design incorporates suggestions made by utility engineers and linemen to G-E sales engineers and specialists.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Voltage Drop Calculations Simplified

RUSSELL C. HUNT, Associate Engineer, Virginia Electric & Power Co, Richmond, Va.

A method has been devised to simplify calculating voltage drops on distribution and subtransmission lines. Being sufficiently accurate for most uses, the method requires a table of constants for different conductor sizes, power factors, and spacings. These constants are used with accompanying voltage equations.

The tabulated values are for $(r + x \tan \theta)$, which represents the voltage drop per kw-mile of line at 1 kv at 25C. Such tables are prepared for the most generally used conductors, spacings, and power factors. Similar tables can be prepared for other temperatures.

To use the method it is necessary to know the characteristics of the load and line. Entering the table with the conductor information and following horizontally across to the proper column for spacing and power factor gives the constant of $(r + x \tan \theta)$. Then this factor is used in any of accompanying equations to simplify the calculations.

Because the constants are normally computed for 3-phase lines, the desired constant must be doubled when considering single-phase lines. For leading power factors the value of $(x \tan \theta)$ becomes negative, or $(r - x \tan \theta)$.

Equations for Computing Voltage Drop

$$\text{Volts drop} = \frac{(\text{kw})(\text{miles})(r + x \tan \theta)}{\text{kv}_r}$$

$$\%\ \text{Volts drop} = \frac{(\text{kw})(\text{miles})(r + x \tan \theta)}{10(\text{kv}_r)^2}$$

$$\text{kv}_r = \frac{\text{kv}_s}{2} + \sqrt{\left(\frac{\text{kv}_s}{2}\right)^2 - \frac{(\text{kw})(\text{miles})(r + \tan \theta)}{1000}}$$

Where:

kv_r = Receiving end kilovolts
kv_s = Sending end kilovolts
r = Resistive ohms per mile
x = Reactive ohms per mile
θ = Power factor angle

Republication Rights Reserved by the Author

Constants for $(r + x \tan \theta)$; Computed for 3-Phase Lines

Conductor			Spacing and Power Factors											
			54 In.				66 In.				78 In.			
AWG or cm	Mat.	Str.	0.80	0.85	0.90	0.95	0.80	0.85	0.90	0.95	0.80	0.85	0.90	0.95
8	Cu	1	4.106	3.995	3.880	3.749	4.124	4.011	3.892	3.757	4.139	4.023	3.9018	3.763
6	Cu	1	2.795	2.688	2.577	2.449	2.813	2.703	2.588	2.458	2.828	2.716	2.5982	2.464
4	Cu	1	1.968	1.865	1.757	1.634	1.986	1.880	1.769	1.642	2.001	1.892	1.7787	1.649
2	Cu	7	1.449	1.351	1.248	1.131	1.468	1.366	1.260	1.139	1.483	1.379	1.2701	1.146
1/0	Cu	7	1.101	1.007	0.9076	0.7947	1.120	1.022	0.9194	0.8027	1.135	1.034	0.9292	0.8093
2/0	Cu	7	0.9760	0.883	0.7858	0.6751	0.9942	0.8981	0.7976	0.6831	1.009	0.9106	0.8074	0.6897
3/0	Cu	7	0.8754	0.7843	0.6890	0.5805	0.8937	0.7994	0.7009	0.5885	0.9088	0.8120	0.7106	0.5951
4/0	Cu	7	0.7921	0.7030	0.6098	0.5035	0.8104	0.7181	0.6216	0.5116	0.8256	0.7307	0.6314	0.5182
250 M	Cu	19	0.7371	0.6501	0.5590	0.4553	0.7554	0.6652	0.5708	0.4633	0.7706	0.6777	0.5806	0.4699
300 M	Cu	19	0.6909	0.6053	0.5157	0.4136	0.7092	0.6204	0.5275	0.4217	0.7243	0.6329	0.5373	0.4283
400 M	Cu	19	0.6283	0.5451	0.4580	0.3587	0.6467	0.5602	0.4698	0.3668	0.6618	0.5728	0.4796	0.3734
500 M	Cu	19	0.5891	0.5078	0.4227	0.3258	0.6074	0.5229	0.4346	0.3338	0.6226	0.5355	0.4443	0.3405
8 A	Cw-C	3	4.1464	4.036	3.921	3.789	4.165	4.051	3.932	3.797	4.180	4.064	3.942	3.804
6 A	Cw-C	3	2.8329	2.725	2.612	2.483	2.851	2.740	2.624	2.491	2.866	2.753	2.633	2.498
4 A	Cw-C	3	1.9919	1.887	1.778	1.654	2.010	1.903	1.790	1.662	2.025	1.915	1.800	1.669
6	ACSR	6/1	4.1791	4.072	3.960	3.832	4.197	4.087	3.971	3.840	4.213	4.099	3.981	3.846
4	ACSR	6/1	2.8351	2.732	2.624	2.501	2.853	2.747	2.636	2.509	2.869	2.760	2.646	2.516
4	ACSR	7/1	2.8404	2.736	2.627	2.503	2.859	2.751	2.639	2.511	2.874	2.764	2.649	2.518
2	ACSR	6/1	1.9909	1.890	1.785	1.665	2.009	1.905	1.799	1.673	2.024	1.918	1.806	1.680
1/0	ACSR	6/1	1.4509	1.353	1.251	1.135	1.470	1.368	1.263	1.143	1.484	1.381	1.273	1.150
3/0	ACSR	6/1	1.1019	1.008	0.9111	0.7977	1.120	1.023	0.9215	0.8057	1.135	1.036	0.9313	0.8124
4/0	ACSR	6/1	0.9749	0.8830	0.7869	0.6774	0.9932	0.8982	0.7988	0.6855	1.008	0.9107	0.8085	0.6921
266.8 M	ACSR	6/7	0.8384	0.7541	0.6659	0.5654	0.8567	0.7692	0.6777	0.5734	0.8718	0.7817	0.6875	0.5623
336.4 M	ACSR	29/7	0.7531	0.6708	0.5846	0.4864	0.7714	0.6859	0.5964	0.4944	0.7866	0.6984	0.6062	0.5011

In Stock Tests

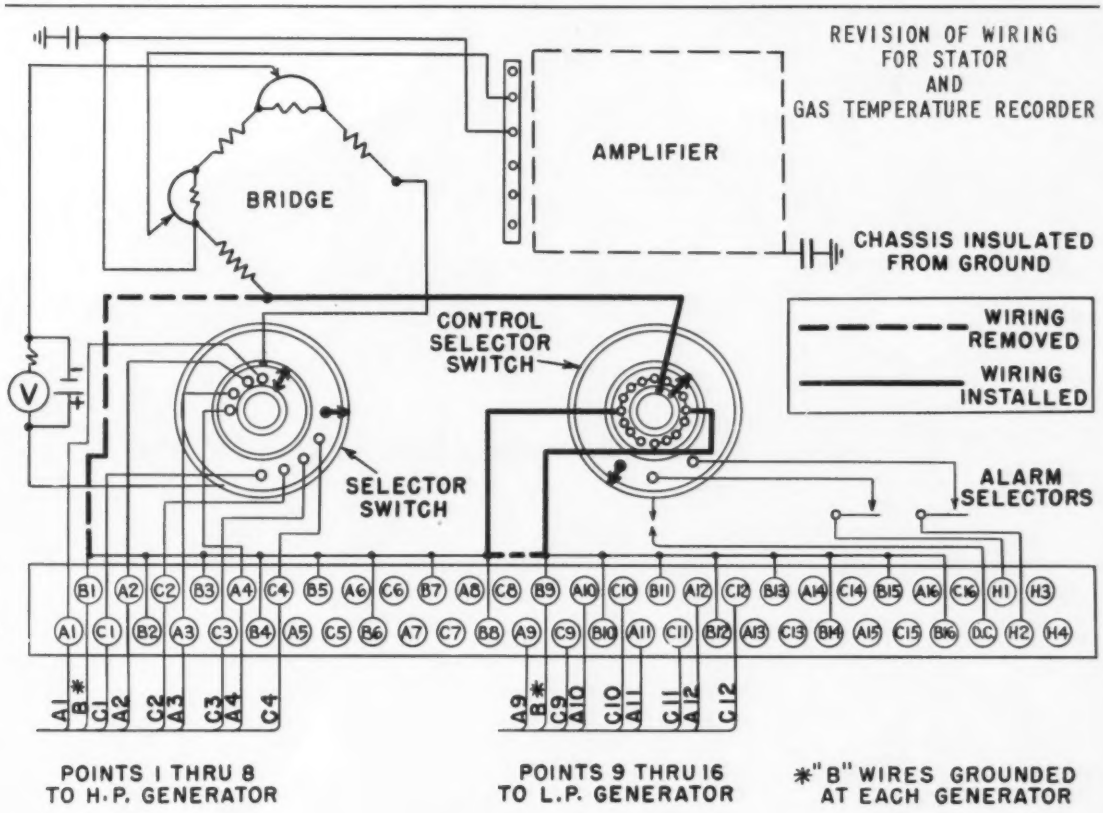
(*Continued from page* 93)

The other high-voltage terminal of the testing transformer is connected to a bolt screwed into one of the insulator caps which are connected by jumpers with clip terminals. Eight or ten insulators can be mounted and energized at the same time. But each insulator and each section is tested separately.

Insulators tested so far have been rated 37 kv or higher. For the 37-kv tests, a standard 110/220/33,000-v transformer is connected to a 120-v source giving 36,000 v. This gives all insulators the same test they would get in service. For higher-voltage insulators suitable transformers are used. It has been suggested that a variable autotransformer might be used in the low-voltage circuit of the testing transformer. But this adds complication.

The initial group of insulators tested consisted of 400 post-type insulators which were to be returned to stock. Seven bad units were found. But for the record, all units were also tested by the insulation resistance method. Good units were placed in a crate labeled with a small metal tag.

The cost of replacing bad insulators in a station cannot be estimated because of the number of variables. Even seven replacements would cost a lot.


REVISION OF WIRING FOR STATOR AND GAS TEMPERATURE RECORDER
AMPLIFIER
BRIDGE
CHASSIS INSULATED FROM GROUND
CONTROL SELECTOR SWITCH
WIRING REMOVED
WIRING INSTALLED
V
SELECTOR SWITCH
ALARM SELECTORS
B1 A2 C2 B3 A4 C4 B5 A6 C6 B7 A8 C8 B9 A10 C10 B11 A12 C12 B13 A14 C14 B15 A16 C16 H1 H3
A1 C1 B2 A3 C3 B4 A5 C5 B6 A7 C7 B8 A9 C9 B10 A11 C11 B12 A13 C13 B14 A15 C15 B16 D.C. H2 H4
A1 B* C1 A2 C2 A3 C3 A4 C4
A9 B* C9 A10 C10 A11 C11 A12 C12
POINTS 1 THRU 8 TO H.P. GENERATOR
POINTS 9 THRU 16 TO L.P. GENERATOR
*"B" WIRES GROUNDED AT EACH GENERATOR

Simple Changes Eliminate Temperature Errors

W. J. HARDMAN, Muskingum River Plant Engineer, Ohio Power Co, Beverly, Ohio

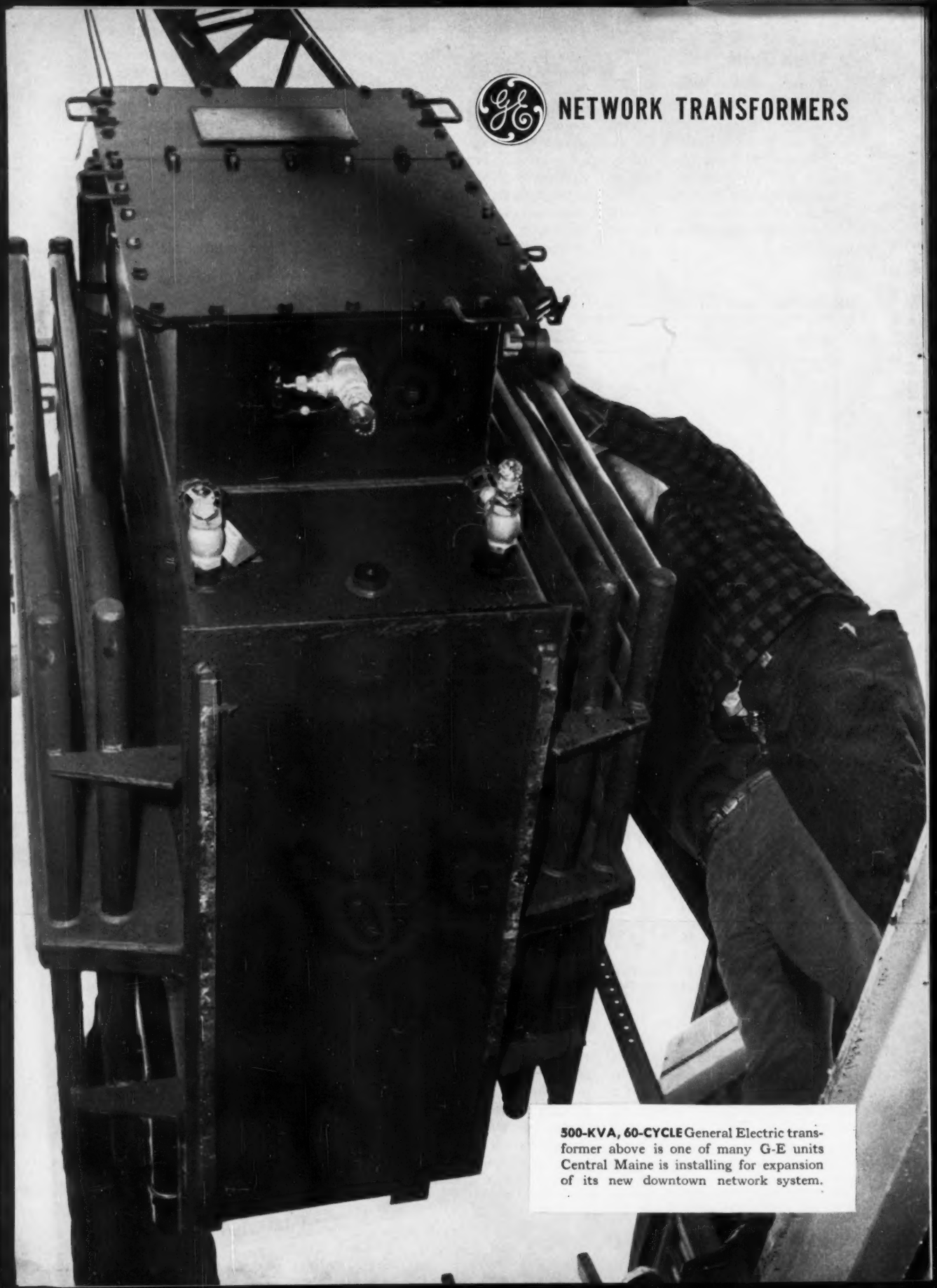
Initial errors in measuring stator and gas temperatures of high and low-pressure generators at Muskingum River plant were eliminated simply by changes in wiring and the use of a spare set of contacts in the alarm selector switch. These changes allow accurate readings at all points.

The initial errors in measuring temperatures originated when the first unit was installed; similar problems can occur with stator and gas temperature recorders for other generators installed since 1952.

The plant's units have resistance-type temperature detectors (thermohms), and the stator and gas temperatures of both high and low-pressure generators are recorded by a single temperature recorder. The original recorder wiring used a common "B" wire to each generator and separate "A" and "C" wires to each resistance temperature detector. The "B" wires were grounded at each generator for protection.

But the difference in resistance of a single "A" wire and two "B" wires in parallel introduced an error in temperature measurements. The error was eliminated by the wiring changes indicated in the diagram and use of the spare set of contacts in the alarm selector switch.

(*More How To on page* 102)



500-KVA, 60-CYCLE General Electric transformer above is one of many G-E units Central Maine is installing for expansion of its new downtown network system.

Why Central Maine Converted Radial System to a Network

In downtown Portland, Maine, the Central Maine Power Company faced today's familiar problem—how best to meet the growing demand for power.

After careful investigation, Central Maine's forward-looking engineers converted the company's 4-kv radial system to an 11-kv network system, recently adding a number of General Electric transformers to expand the system. In changing to a network, Central Maine gained these advantages:

Improved regulation—Voltage drop with the new system is less than 5% in the network area even under heavy load demands, thus assuring stable voltage for consumers.

Increased dependability—With the network power lines underground, service continuity is further assured. Even though two of the 1955 hurricanes passed through Portland, the network system continued to supply power to doctors, local government offices, and other vital services in the center of town.

Best possible service for customers. With load increasing fast on the old radial system, unscheduled outages, breaker operation, and fuse blowing could have become a source of concern. The new network system helped assure continuity by eliminating the cause of such troubles.

FOR HELP IN PLANNING YOUR SYSTEM

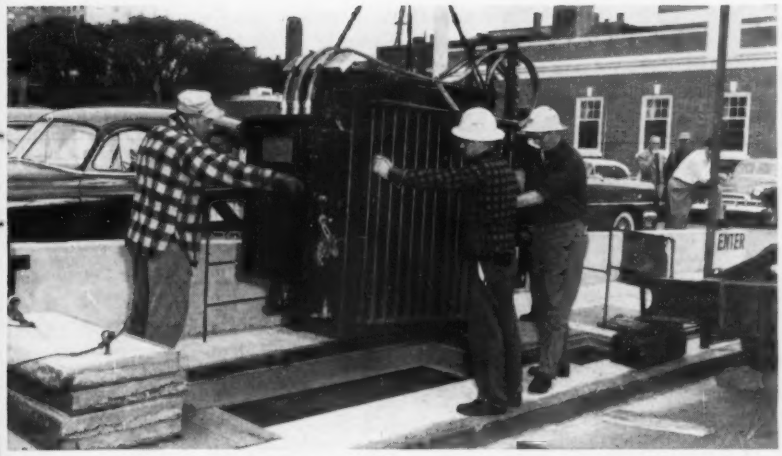
Today's General Electric network transformers are the culmination of more than 30 years' experience in building transformers for network service.

G-E network transformers installed on your system now, allow you to meet increased current demands. When expansion is needed in the future, you have the start for a network system.

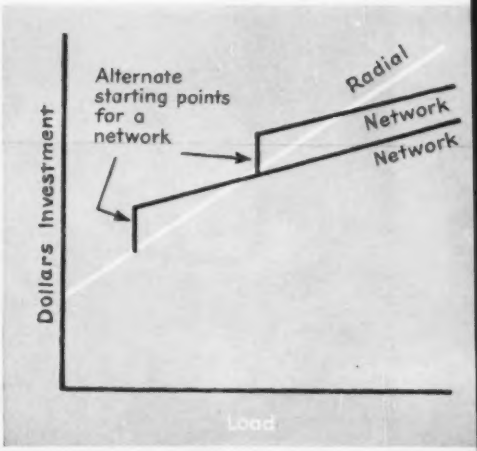
For information on G-E network transformers, and for help in planning your network system, call the nearest G-E Sales Office. Or write for Bulletin GET-2432. General Electric Company, Section 435-12, Schenectady 5, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC



EASY TO INSTALL, G-E transformers were connected without interrupting service. Central Maine Company men connected cable terminations in their service shop to further simplify installation.



IT COSTS more to increase capacity by changing to a network than by expanding a radial system. But future increases cost less with the network.

LOW-COST, LIGHTWEIGHT REEL pays out or reels in wire and is particularly useful on small operations in the field

TO REMOVE COIL from reel, the reel is taken from stand, one end of reel is removed and coil is slipped from reel

Low-Cost Reel Saves Time on Small Operations

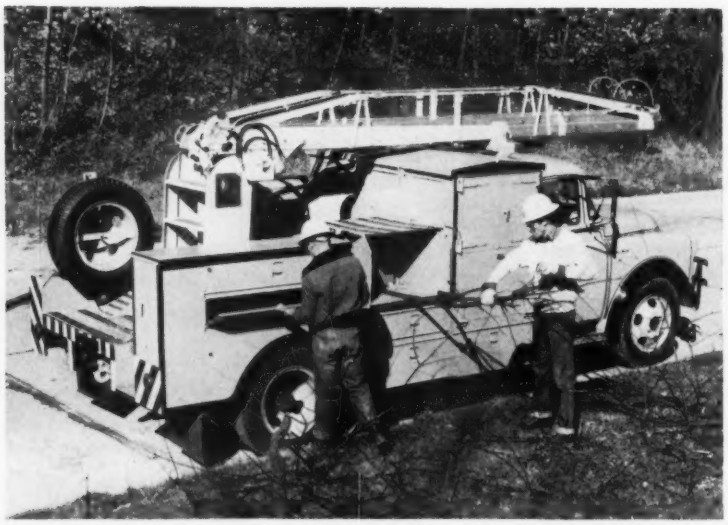
M. L. MONSON, Superintendent, Municipal Utilities System, Fosston, Minn.

A low-cost, light-weight reel has been developed by the author for paying out or reeling in wire on small operations. The reel can be taken apart so that a coil of wire can be slipped on when it is to be used as a pay-out reel. Or, when wire has been coiled on it, the reel can be taken apart to remove the coil. In use, the reel is supported at a convenient height by a stand.

When wire is coiled on the reel and the coil is to be removed, the reel is lifted from the stand, and the end piece of the reel removed. The coil is then slipped from the reel at one end.

DISTRIBUTION—Maintenance

Truck Eases Tree-Trimming Operations



C. L. TROUT, Superintendent, Construction and Operation Electric Distribution Dept, Cincinnati Gas & Electric Co, Cincinnati, Ohio

Trimming trees at scattered locations has been greatly facilitated on the Cincinnati Gas & Electric Co system through use of a truck designed for this work. The truck has a hydraulic aerial ladder and a separate motor-driven chipper with a box for storing chips. The chip box has a side opening for removal of chips and a removable top for hauling brush when the chipper is out of service.

This compact unit is operated by a senior tree trimmer and truck driver. Tree pruners are carried in a top-opening box on the side of the truck.

(*Continued on page* 104)

Plates from REVERE for a BIG JOB

by C. H. WHEELER

Here you see two rolled Muntz Metal condenser plates, being drilled simultaneously in the plant of the C. H. Wheeler Manufacturing Co., Philadelphia 32, Pa. The plates were supplied by Revere. They measure 100-¾" x 203-¾" x 1-½" thick. Four plates were supplied for a Wheeler 2-pass divided water box unit having 95,000 sq. ft. of condensing surface. The overall length of the condenser, including water boxes, is 48 ft., and overall height, including steam dome and hot well is 34 ft.

Revere is an important supplier of plates and tubes for condensers, heat exchangers, and similar equipment, shipping to all parts of the country. Collaboration on alloy selection and specification is freely available. Just get in touch with the nearest Revere Sales Office.

COPPER ★ BRASS ★ 18 01 ★ REVERE ★ ALUMINUM

REVERE COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

230 Park Avenue, New York 17, New York

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.

Sales Offices in Principal Cities, Distributors Everywhere

MR. PURCHASING AGENT:

WHAT DO YOU KNOW ABOUT RT&E?

As one of the important men who supply power to America, you should know something about one of America's leading suppliers of power equipment.

While we are not the largest transformer builder, you will find us one of the most dependable. We know that you consider more than cost, that you require an extra measure of dependability and service from your suppliers. That's why you'll want to know more about RT&E.

You should know that *only* our transformers are guaranteed for *five full years* of service. And that RT&E is never too busy or standardized to build *exactly* what you want.

You should know that we maintain warehouse stocks for prompt delivery in your area, that our sales staff is trained and ready to assist you.

Next time you purchase transformers, consider RT&E. It will pay with *more* than money.

RT&E CORPORATION
WAUKESHA, WISCONSIN

Equipment to help provide power for America

Tree Trimming

(*Continued from page* 102)

A mechanical signal drops in front of the windshield to show the driver that the ladder is up. The truck may be used during storm periods as a spare trouble truck or for the removal of damaged trees.

MAINTENANCE

Vehicles, Engines Stored Safely

F. N. SINGER, Transportation Engineer, American Gas & Electric Service Corp, New York, N. Y.

The following procedure applies to putting gasoline or diesel-engine vehicles in storage for a period not to exceed one year, and to stationary engines of similar type used in construction work.

The engine, either gasoline or diesel, should be cleaned and any rust spots wire-brushed and painted. Bright work or machined surfaces should be thinly covered with light oil or vaseline. The engine should be run until warm and then the drain crankcase should be drained. The crankcase should then be refilled with an oil of viscosity recommended by engine manufacturer or complying with U.S. Army Specifications 2-126 for engine oil. The engine should be spun until the oil reaches all parts of it.

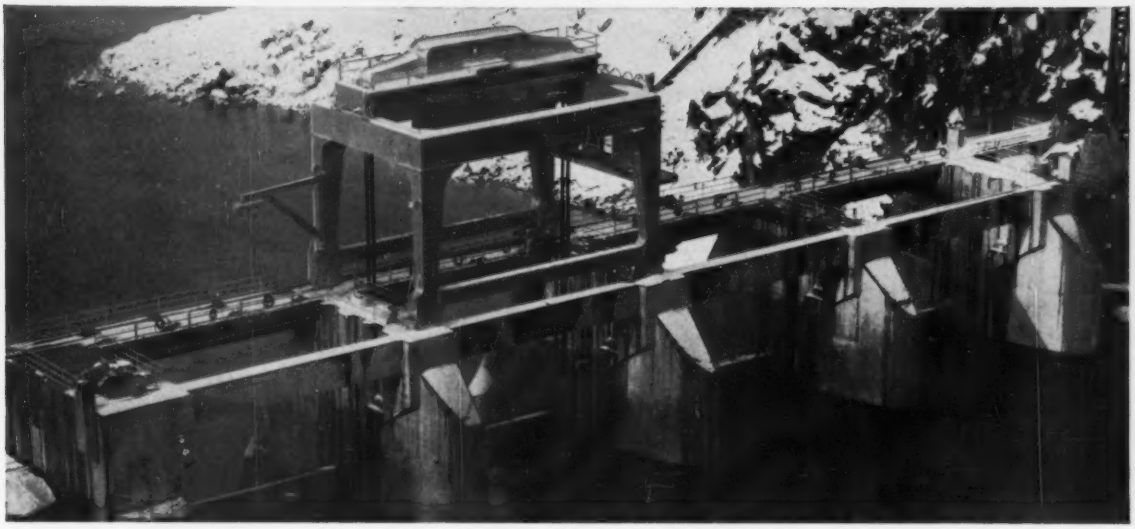
Plugs Should Be Oiled

When there is any fuel in the tank, the engine can be run for 15 min. Spark plugs (or injectors in diesel) should be removed and about 2 ounces of oil should be put in each cylinder. The engine should be rotated for at least five revolutions. Oil should be put on the points, threads, and terminals of the plugs. The plugs or injectors should then be replaced. The process of spinning the engine, removing the plugs or injectors, putting oil in the cylinders, and rotating the engine should be done every six weeks.

V-belt tension should be removed.

Exhaust and intake openings should be covered to exclude rain and moisture.

(*Continued on page* 108)



100 ton crane, built by Paceco for Public Utility District #1, Pend Oreille, Washington; Harza Engineering Company, Engineers.

preliminary consultation with Paceco cut 15% from the cost of this crane...

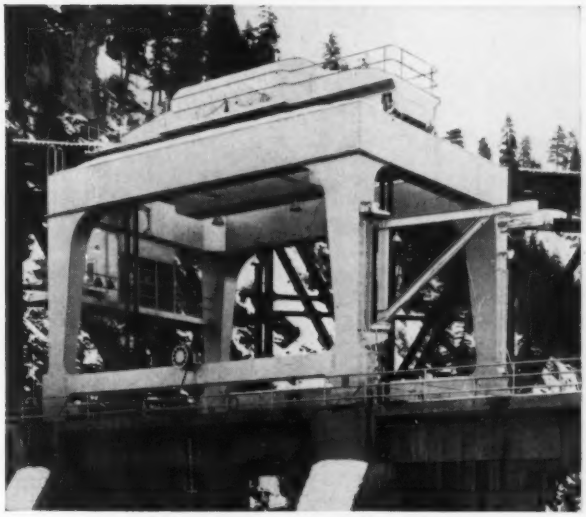
Competitively bid contract was awarded to Pacific Coast Engineering Company at approximately 18% lower cost. Reason for lower cost: Paceco trolley design, using all-welded, box girder construction that eliminated 50% of the normal weight of the trolley unit.

Paceco designs and builds cranes of all types, as well as hoists, high pressure gates and valves; intake gates.

Some units we build direct from the buyer's plan. In many instances, however, Paceco engineers work with the buyer *at the designing stage*. Experience, such as with this crane pictured, has proved this consultation may sharply lower initial cost, improve operational efficiency and reduce maintenance.

For over 30 years, many of the country's leading utilities and engineering contractors have enjoyed Paceco's quality control, engineering skills and price economies – *all under one responsibility*.

We invite consultation on your requirements.



PACECO

"TAILORS OF STEEL"®

PACIFIC COAST ENGINEERING COMPANY ENGINEERS • MACHINISTS • FABRICATORS

Alameda, California, LAkehurst 2-6100
Pasadena 8, California, 3018 E. Foothill Blvd., RYan 1-9373
Kansas City 12, Missouri, 4706 Holly Street, PLaza 3-3737
Houston 2, Texas, 3619 Robinhood, MOhawk 3504
PACIFIC COAST ENGINEERING COMPANY, INC.
New York 17, New York, 51 E. 42nd St.

small-diame

what does it mean in new O-B Bushings?

- Meets ASA Standards in the range now approved. At ratings not yet included in the standard, the same basic design principles prevail.
- Available for all voltages from 15 to 230 kv.
- Fits all modern transformers and circuit breakers.
- Reduced diameter facilitates application to older station equipment for replacement purposes during modernization.
- At every voltage rating, full condenser construction is employed for the insulating core.
- Backed by 45 years of extensive production, outstanding success, and fine reputation in the bushing field.
- The only bushing on the market manufactured by independent insulation specialists.

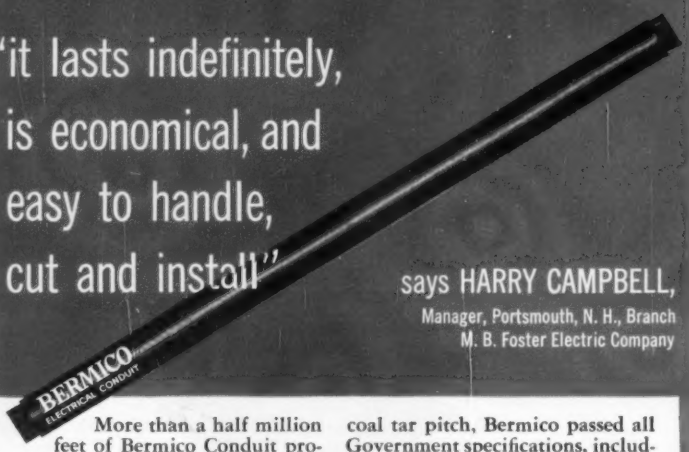
4645-H

ter
Ohio Brass
MANSFIELD
OHIO, U.S.A.

BERMICO® electrical conduit was installed at Portsmouth Air Force Base because...

"it lasts indefinitely, is economical, and easy to handle, cut and install"

says HARRY CAMPBELL,
Manager, Portsmouth, N. H., Branch
M. B. Foster Electric Company



More than a half million feet of Bermico Conduit protect the power, communications, runway-light, and control tower cables at the new Portsmouth Air Force Base in New Hampshire.

This Foster Electric official says he believes Bermico will serve the huge Strategic Air Command Base indefinitely.

Made to precise standards from cellulose fibre impregnated with coal tar pitch, Bermico passed all Government specifications, including heat resistance, uniformity, length-, crushing-, chemical-, and boiling-resistance, plus resistance to water absorption and flattening.

For best protection and utmost ease of installation, do what leading electrical contractors and public utilities everywhere do. Specify Bermico Conduit. Immediate shipment of all sizes and fittings.

Distributed by WESTINGHOUSE Electric Supply Company
Offices in principal cities

BROWN QUALITY COMPANY
Berlin, New Hampshire
GENERAL SALES OFFICE: 150 CAUSEWAY STREET, BOSTON 14, MASS.

Vehicle Stored

(*Continued from page* 104)

The battery should be removed for temporary storage and put on a trickle charge. For dead storage of vehicle or engine for any long duration, the battery should be used in another unit.

Tanks Should Be Drained

Tanks—air or vacuum reservoirs—should be drained and the drain cocks left open. Hydraulic tanks should be full. In temporary storage the gasoline tanks should be full and contain an additive like Gulf SDL. The engine should be run until the treated gasoline has filled the carburetor. In dead storage the gasoline tank should be drained and the engine run until all gasoline in the carburetor has been used. Diesel fuel oil tanks should be full.

Antifreeze a Precaution

The radiator should be filled with water containing a good antifreeze and rust inhibitor. Sufficient antifreeze should be used for the lowest temperature anticipated.

Transmission and differential should be filled to levels recommended in the lubrication chart. The chassis should be thoroughly lubricated according to the lubrication chart for that particular make of vehicle.

The body should be cleaned thoroughly and any rust spots wire-brushed and painted. All rubber weather stripping should be treated with a rubber lubricant. All chrome trim or bright work should be thinly coated with light oil or vaseline. All windows and windshields should be closed.

Tires Off the Ground

Tires should be cleared from the ground (by blocking up the vehicle) and inflated to proper operating pressure, which should be checked every two weeks if in temporary storage. If in dead storage, the tires should be removed and stored in a cool, dark, dry place.

Brakes should be released. The clutch should be disengaged and held in that position by a small block of wood between the clutch pedal and the underside of the floorboard.

(*More How To on page* 117)

D. W. Gunther, Mgr. Materials Engineering, points out some of the controls that make sure the quality designed into Westinghouse products is delivered to you.

How Westinghouse takes trouble out of your workaday world

Trouble-free equipment is no accident. At Westinghouse, the quality that keeps your equipment out of trouble starts on the designer's board, is assured . . . often enhanced . . . by material selection, and it is safeguarded by precise control of production.

Take one. Any Westinghouse product. You can't miss. From production order to shipping platform, this is *your apparatus* . . . its quality, *our responsibility.*

WATCH WESTINGHOUSE!

WHERE ***BIG*** *THINGS ARE HAPPENING FOR* ***YOU!***

We're proud of the men who stake their reputations on these motors.

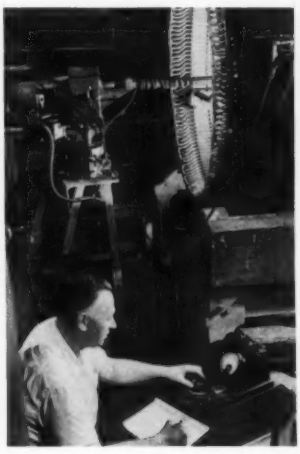
147 OK's, 26 double-check signatures say "it's right"!

That makes the Westinghouse powerhouse motor — available in ratings to 5,000 hp — the nearest approach to "won't fail, won't let you down" in the industry.

Indoors or outdoors, it is designed to do its job — withstanding dirt, heat, moisture, or loads beyond normal service requirements. Its materials are specially selected, many specifically developed, to meet unusually severe performance standards.

But our real point of pride is the conscientious check - on - check manufacturing procedure that culminates in 26 special in-process inspections, signed by responsible department supervisors. Your motor is right, step by step. Twenty-six personal reputations and careers are bet on it.

Supervisor of inspection signs the release — here an 800-horsepower, 10-pole induction motor is checked over to make sure Micarta® slot wedges and stator windings are perfect. Following this inspection, windings are tested for grounding.



High-frequency test — inspector tests for turn-to-turn faults as the rotor arm slowly revolves, inducing voltage into the windings. This check reveals any short-circuited windings, assures that coils are correctly connected.

Vibration test — balancing equipment checks rotor shaft, frame and bearing brackets for vibration, determines amount and location of imbalance.

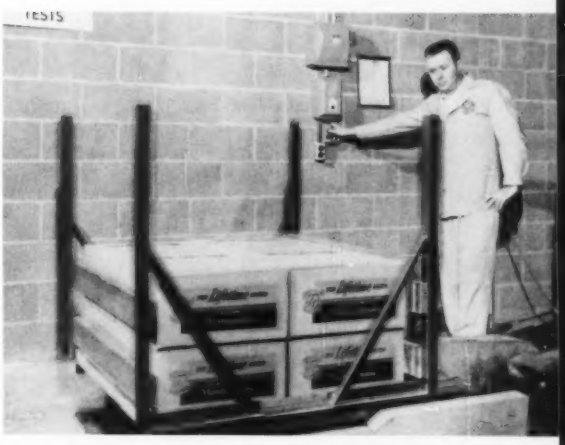
WATCH WESTINGHOUSE

The new meter plant, specifically designed for meticulous manufacture.

A million out of a million are right!

100% inspection is key to uniform meter quality

You get uniformly accurate and dependable meters from Westinghouse for the simple reason that substandard units are not finished or shipped. The "go, no-go" test above, at line's end is no mere sampling. It checks *every* meter. The automatic full-load, light-load and power-factor test must be passed or the meter will not be shipped. Quality production with testing like this is one of the reasons why the Westinghouse meter is the only meter *guaranteed for life.*



Vibration and drop tests are conducted regularly to discover any possible source of damage in shipment. Specially designed packaging for Westinghouse meters has been awarded the seal of the National Safe Transit Committee.

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Building quality is a way of life with men in transformer and voltage-regulator production.

Quality is a certainty . . . Every regulator is given a complete operation and insulation check prior to shipment. Here the CJ-1 relay settings get a final monitoring.

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU**!*

Proved on the production line . . .

Quality that's designed in, stays in

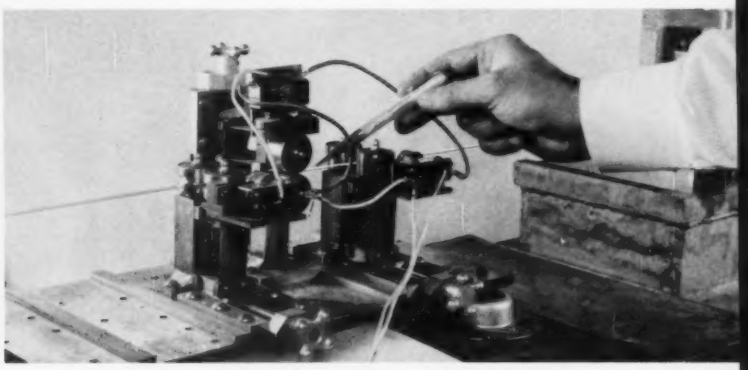
The heart of a program that has actually pitted department against department in plant-wide contests to assure manufacturing quality is this slogan: "Quality must be ***built*** into a product; it cannot be ***inspected*** into it!"

In addition, all Westinghouse foremen spend one week end each year attending a QUALITY SEMINAR where they exchange new ideas and experiences.

Quality control is more than a procedure at Westinghouse. It's an attitude, inspired by team spirit, proved by on-the-line tests. It's your best assurance that Westinghouse equipment will give you the trouble-free performance you want.

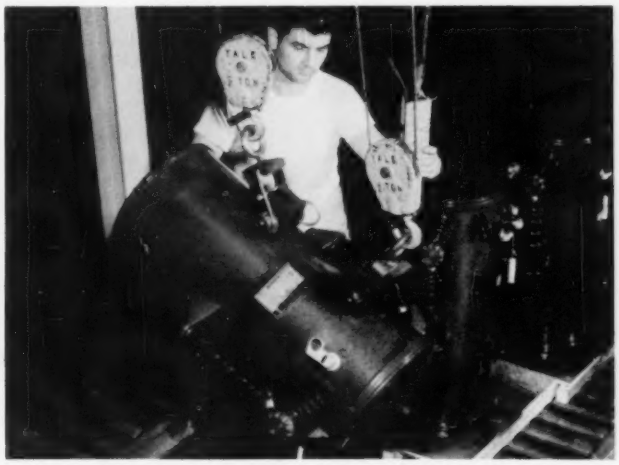
Basic "take it" ability of Westinghouse apparatus, mechanically and electrically, is thoroughly proved on the production line — far beyond service requirements.

Quality is wound in . . . High-frequency test checks turn-to-turn and layer-to-layer insulation both *before* and *after* assembly of transformers and regulators. Preassembly testing is vital, since insulating value of oil might temporarily hide flaws detectable only at this point.



Quality is 3,000 miles long . . . Minute burrs and imperfections on copper wire and strapping can damage insulation. That's why Westinghouse perfected a new system of detection that eliminates any flaw greater than 2 mils. With insulation at a minimum of 20 mils, the protection factor is better than 10 to 1.

Quality is three skins deep . . . Westinghouse "Coastal Finish," an exclusive three-layer protective skin for transformers, and regulators, forms a granite-hard, weather-resistant surface. Every transformer gets a minimum paint thickness test and a paint adhesion test.



Quality even upside down . . . Tilt test for transformers is the last check on the shipping room floor against oil and air leaks. Pressure tests are also applied before painting, and again after painting when the unit is filled with oil. Every transformer produced receives preproved performance checks like these.

While many production tests are complex, these are direct, simple, effective.

Trial by vacuum — entire interrupter chamber is evacuated to less than one micron with the vacuum manifold above as a final check on soundness of joints and seals; next operation, filling the unit with sulphur hexafluoride.

Trial by water — here the completely assembled interrupter chamber takes the bubble test. In this check, the chamber is filled with dry nitrogen to 30 pounds pressure; leakage, if it exists, is instantly detected.

Here a bubble is a sign of trouble

Westinghouse gas-type interrupters like the VLB switch can't tolerate leaks, or they're short-lived on your lines. Bubbles in water-immersion tests point straight to any potential source of trouble.

All valves and gauges are subjected to 30 pounds pressure with dry nitrogen and "dunked" to prove themselves before they get onto the production line. The operating shaft seal is given the same test and then, after complete assembly, the entire unit is again checked for bubbles.

To assure complete tightness of all joints and seals, the entire interrupter chamber meets a much tougher test. It is evacuated to less than one micron and held there for 20 minutes to check against any pressure rise.

Only then may it be filled with the sulphur hexafluoride which will effectively quench arcs through its long, dependable service life.

Precision manufacturing techniques, proved by simple tests like this, make the VLB interrupter safe for your system.

WATCH WESTINGHOUSE

Increased breaker ratings add importance to testing of components.

Quality to its finger tips

Power breaker contact tips take 12,000-lb. stress

The brazed joint between silver contact tip and Cupaloy body of every single breaker contact is stressed to 12,000 lbs. This test is made on all curved joints, from both directions.

Transmission of larger and larger blocks of power has sent breaker ratings skyrocketing . . . and the greater the capacity of the breaker, the more important it becomes that every component be checked for utmost dependability. That's why Westinghouse tests breakers, right down to their contact tips.

The business end of the interrupter contact in a Westinghouse De-ion® grid is a silver-tungsten tip brazed to a Cupaloy* body. Before assembly, every piece is 4 times tested for quality and strength of braze. The ability of the breaker to stand up to the mechanical stresses of high power faults and high-speed reclosing is preproved with the severe quality tests shown here. For instance, the Rockwell hardness test: After brazing and heat-treating, every single Cupaloy body is checked for hardness, to make 100% sure breaker contacts will withstand the punishment of short-circuit operation.

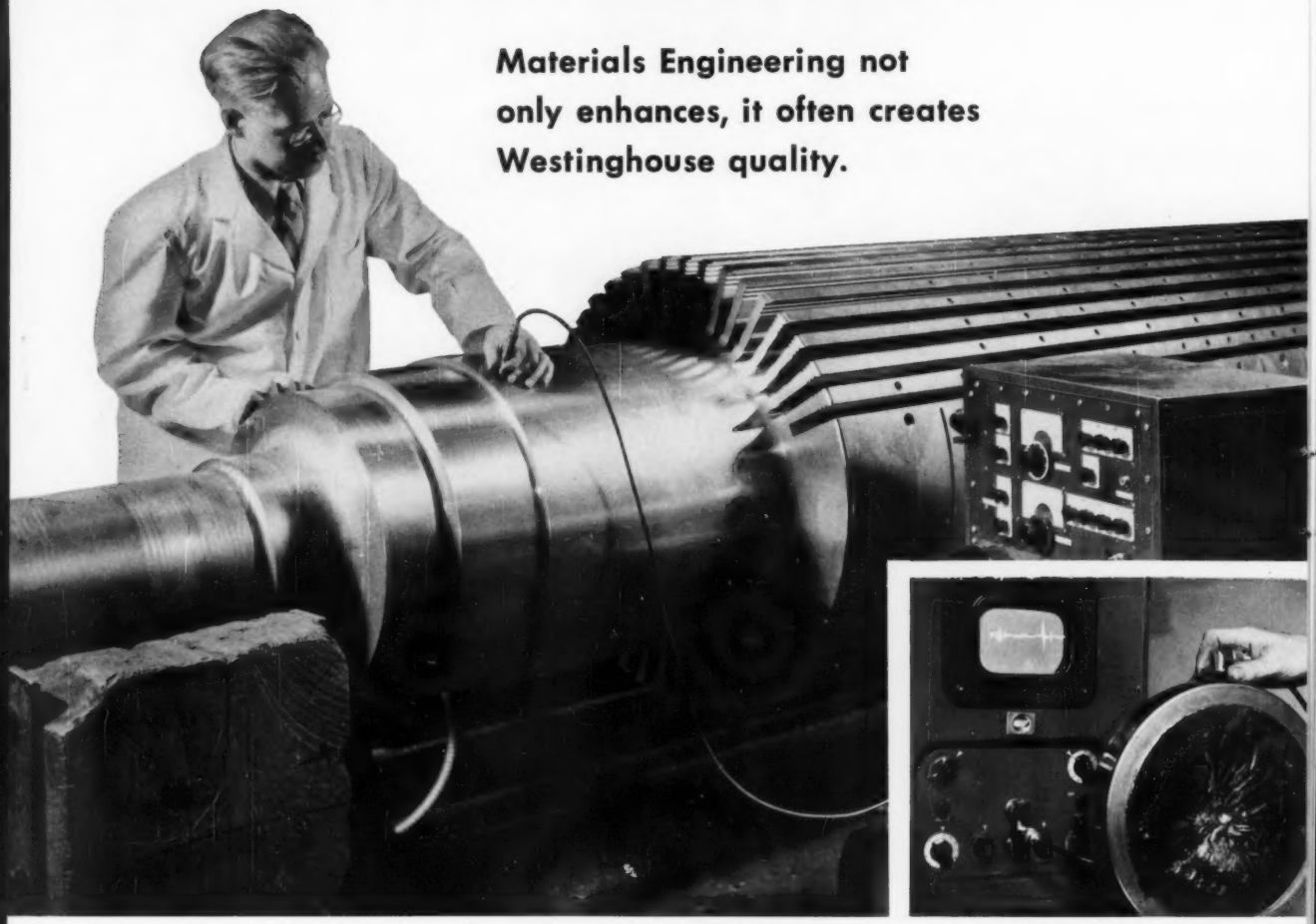
These are just a few of the tests Westinghouse breakers go through on their way down the production line. The doubts are hammered out — to give you all the performance that good design intended.

*Trade Mark

In the ultrasonic test, the electronic reflectograph proves that brazed areas are free of even microscopic faults.

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

Materials Engineering not only enhances, it often creates Westinghouse quality.



Ultrasonic test — 34 feet of turbine-generator rotor is thoroughly checked in minutes by high-frequency sound. Cracks, inclusions or other flaws can be detected instantly in this production line, nondestructive test. (Right) Basic materials are also tested to design strength and beyond; they go into production a thoroughly known quantity.

Torture, look and listen

By this the finest material is selected . . . or developed

More than 260 full-time engineers and technicians utilizing a multi-million-dollar laboratory team up with the experienced design staff to give Westinghouse the foundation on which conscientious craftsmanship builds quality.

They set standards for basic materials and establish line checks by which standards are enforced. But more than that, they probe for new materials, new principles for solving design or procurement problems.

Thus, Westinghouse quality rests on a firm tripod: Top design engineering meets service requirements; materials engineering matches design demand; production faithfully meets the standards of both.

This facility of Westinghouse is unequaled in the industry. That's why it's right to say, "You can be *Sure,* if it's Westinghouse."

WATCH WESTINGHOUSE!

*WHERE **BIG** THINGS ARE HAPPENING FOR **YOU!***

CP 1036

Capacitors on Pole Conserve Time, Substation Space

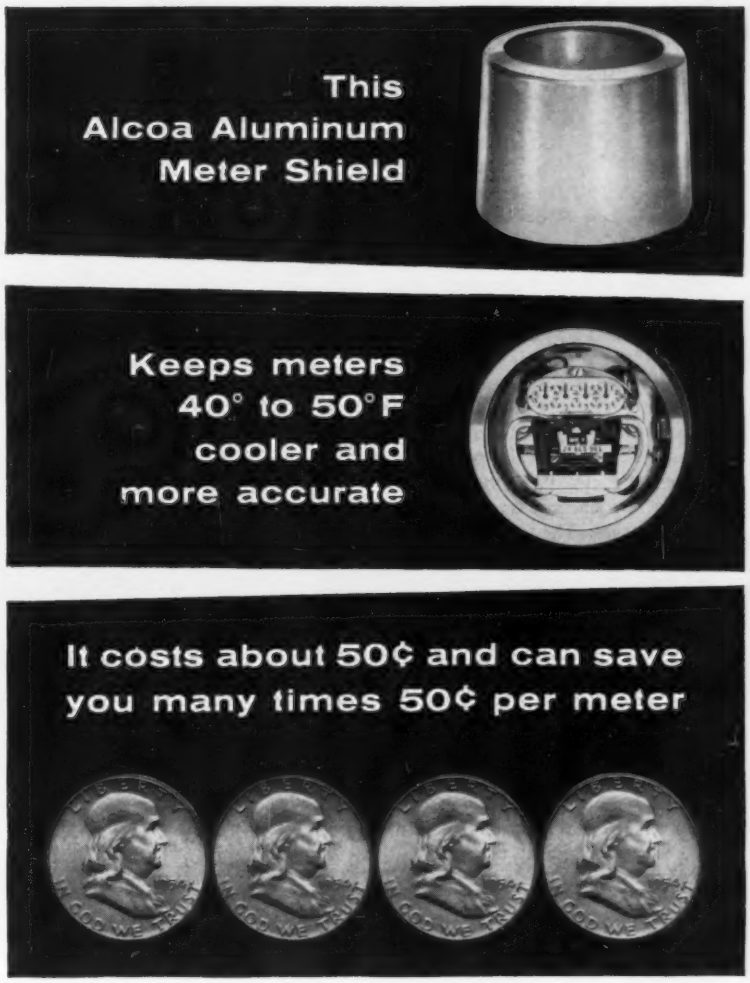
A. H. THIERMANN, Senior Engineer, Substation Engineering, Virginia Electric & Power Co, Richmond, Va.

A single-pole capacitor installation is used by Virginia Electric & Power Co to conserve substation space and reduce costs slightly. Standardizing on this type of installation halves engineering time and practically eliminates drafting.

The installation consists of a 40 to 45-ft pole around which are mounted three rings of capacitors, 5½ ft apart. Capacitors are switched by three single-phase reclosers, actuated by voltage, current, or a combination of both. Banks in each tier are fused.

Two sizes of such installations are used. A 900-kvar bank, on a class IV pole, was tried first and found successful. This has 36 25-kvar capacitors. After the introduction of 50-kvar units 36 were mounted on a class II pole to provide 1,800 kvar of reactive, as shown in the illustration.

This type of installation, called the "Christmas Tree," has been used for two years without trouble.



Alcoa® Aluminum meter shields are designed to protect damping magnets against surges caused by lightning. Surges cause meters built before 1946 to run much faster . . . lead to embarrassing conflicts with customers.

They also keep meters up to 50° F cooler by reflecting heat from the sun. This is especially important with delicate demand meters.

Typically, power company experience shows it costs about $1.50 every three years to inspect meters. Repairs average $5.00. Alcoa meter shields can extend this repair cycle, protect the meter for longer periods and assure maintaining its accuracy.

For complete details and prices (generally running about 50¢ per shield), contact your nearby Alcoa sales office. Aluminum Company of America, 2308-H Alcoa Bldg., Pittsburgh 19, Pa.

THE ALCOA HOUR
TELEVISION'S FINEST LIVE DRAMA
ALTERNATE SUNDAY EVENINGS

Your Guide to the Best in Aluminum Value

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA
©ACOA

How to Avoid Growing Pains

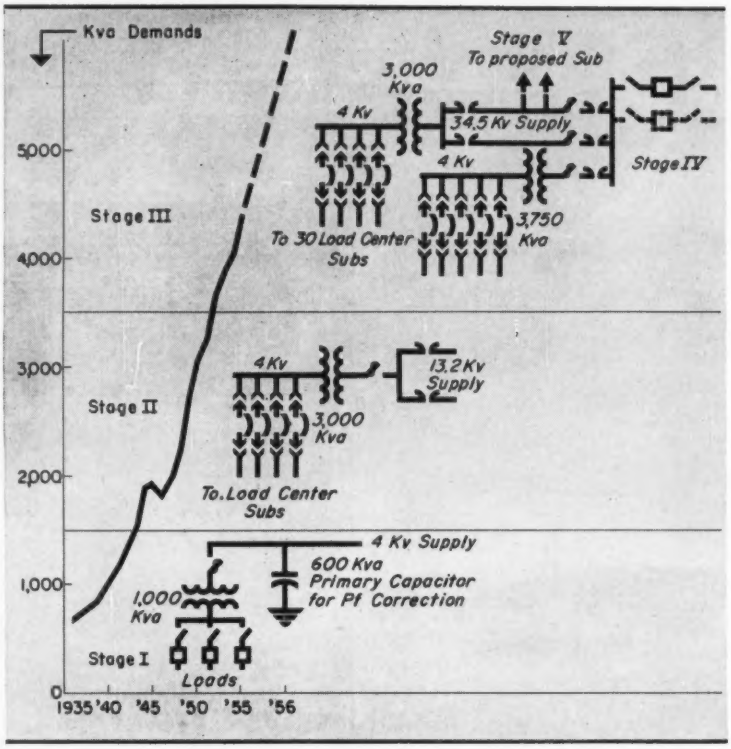
CHARLES M. HILL, Power Sales Supervisor, Niagara Mohawk Power Corp, Troy, N. Y.

How does a thriving company avoid growing pains in its electrical distribution system that may hurt production? Careful advance planning was the answer found by Behr-Manning, Div of Norton Co, Troy, N. Y. This maker of coated abrasive products has passed painlessly through three stages of electrical expansion already, but advance planning now encompasses the fourth and fifth stages. The first three stages, shown in the chart, are:

- Operation through a 2,400/4,160 Y substation fed by the general city distribution.
- Addition of a new substation to take dual supply 13.2 kv transmission line service after the plant's first substation was outgrown in 1943. (Behr-Manning bought the 4-Kw substation and made it a load center unit.)
- Stepping up the supply voltage to 34.5 kv and erecting a major substation near a large group of new buildings which were to house heavy equipment.

Here again advance planning paid off, for both Behr-Manning's substation and the power company's line between it and the new site already were constructed for higher voltage and needed only reinsulating. This preliminary work was done during the vacation shutdown in 1952 while a temporary 4 kv service carried necessary plant equipment. When the new substation was completed in 1953 and the old station was ready for conversion to 34.5 kv, the work was done in steps without a plant shutdown by keeping one station alive at all times. New 34.5 kv metering equipment was installed at the new substation.

Stage IV is in the making. Equipment already on order will terminate a second transmission circuit at the new substation which originally was designed to take it. The two circuits will form a loop in a transmission line having firm supply at each end. Two main breakers will be equipped with distance-directional relays to reduce likelihood of a total plant power failure.



Stage V is projected as the next major step when plant expansion may dictate a third substation. When the time comes to work out the details, Behr-Manning's engineer and his friend, the power man, will give the problem the same thoughtful care that has paid such handsome dividends in the past.

From this 25-year history, it becomes apparent that satisfactory growth of an industrial plant is closely related to careful planning. When planning includes improvements to electrical facilities to match productive increases, the company will have less trouble with production electrical equipment. Fewer shutdowns will occur to cripple production.

Behr-Manning always has stayed two jumps ahead of such trouble. Since the early thirties, Niagara Mohawk and Behr-Manning have worked as a team toward solving electrical problems in advance. For instance:

Each change in supply or plant distribution voltage, and each expansion of facilities had to be carefully thought through and scheduled to avoid production tieups. Many operations in this plant are on a 24-hr-a-day, year-'round basis. Vacation periods and weekends permitted interruptions.

Each equipment addition had to be checked in advance for its effect on feeders, breakers, and transformers supplying it. Each major load change required the converging of many specialized engineering talents to make certain that both new and old breakers and fuses would be adequate for heavier fault currents and would coordinate perfectly with others, both in the plant and on the power company system.

Throughout all of these changes the author and his friend the plant engineer found again and again that the two keys to successful planning are "in advance" and "together."

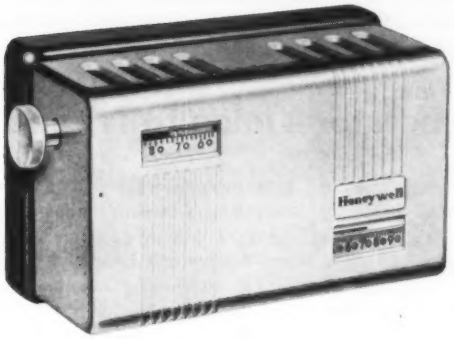
New Honeywell

Line-Voltage Thermostats

Especially designed for electric heating

They level out the hot peaks and cold valleys!

Competitively Priced



The T40 (horizontal) quick cycling for low mass, quick heating —quick cooling units. So sensitive it responds to 0.4° change in temperature. Ends roller-coaster heating because it cycles 15 to 20 times per hour under a normal 50% heating load.

The T41 (vertical) for ceiling cable with high mass, slow heating —slow cooling characteristics. Slower cycling—three to six times per hour—makes it ideal for ceiling cable heating. Has an operating differential of less than one degree.

TWO NEW thermostats from Honeywell! These inexpensive, gold-bronze finish thermostats have been especially designed for electric heating needs. They maintain their temperature setting with less droop than any other line-voltage thermostat. They have *rapid cycling* to give longer heat element life, fewer service calls. And there's ample venting for accurate air sampling. Installation is fast and easy, too. Next installation, ask your manufacturer for Honeywell controls, the new standard of comfort control in electric heating systems. For complete information call your local Honeywell office. Or write Honeywell, Dept. ET-8-163, Minneapolis 8, Minnesota.

Also available—the famous Honeywell Round and Switching Relay for electric heating applications.

MINNEAPOLIS
Honeywell

112 OFFICES ACROSS THE NATION

First in Controls

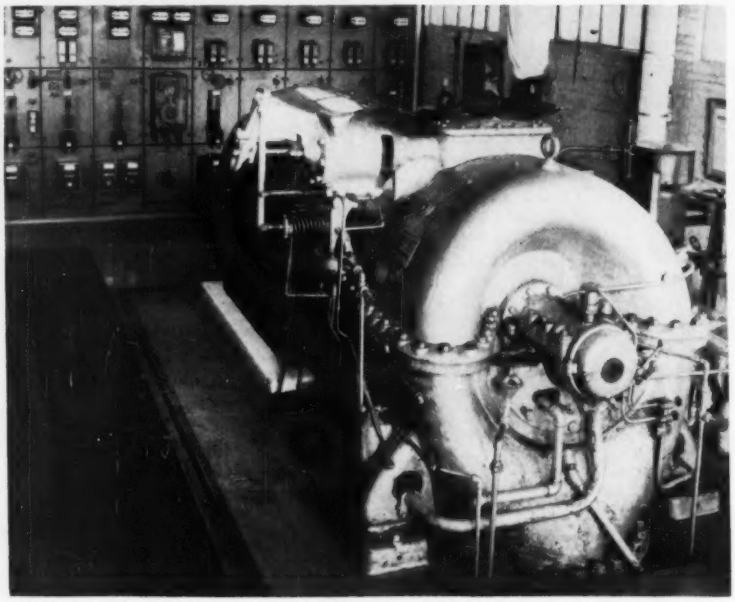
full 90° bend with one stroke of the ram . . . easy portability . . . extra versatility

Here's the kind of real portability you've been looking for in a bender for ½" to 2" pipe and conduit. Using light, but strong, aluminum alloy for many parts, the new GREENLEE No. 880 Hydraulic Bender is unusually *lightweight*, yet extra rugged, fast, powerful . . . produces 15 tons of ram force! One man can easily carry and operate it to quickly make uniform bends. Complete 90° bends can be made with one ram stroke. Separate two-speed hydraulic hand pump and bending ram simplify handling and setup. Easily operated by hand or may be teamed with a GREENLEE Power Pump for fast production jobs.

Attachments also available for bending thin-wall conduit, tubing, bus-bars. Get complete details on how to speed jobs and get better results with the new GREENLEE No. 880 Bender. Write for Bulletin E-217.

GREENLEE

GREENLEE TOOL CO.
1808 Columbia Ave., Rockford, Illinois



WORKING TOGETHER, university analyzer staff and utility engineers combine talents to solve complex system protection problems on the new network analyzer

Industrial Generator Yields to NYSEG

When plant growth necessitated a new distribution system at Perry Knitting Co, Perry, N. Y., NYSEG worked with the company to help it use as much of the old system as possible. The money saved was to be earmarked for the time when the knitting company would switch over to 100% purchased power. Through heat balance analyses and economic studies, it was shown that purchased power would be economically sound, and the knitting company's 1,250-kw, 300-lb condensing automatic extraction turbine was shut down.—A. L. Lawton, Power Engineer, New York State Electric & Gas Corp, Elmira, N. Y.

INDUSTRIAL NEWS NOTES

AF Program Gets Furnace

An electric steel forging furnace, designed for the Air Force heavy press program, will heat steel billets in a controlled atmosphere for a 50,000-ton forging press at Grafton, Mass., according to C. I. Hayes, Inc., Providence, R. I.

The heating chamber will accommodate 10,000 lb of steel billets up to 16 ft long, bringing them to 2,400F. The furnace has "certain curtain" atmosphere control throughout the heating chamber so that billets reach the press scale free, thus assuring maximum die efficiency and optimum workability of the steel. It has a connected load of 600 kw.

•

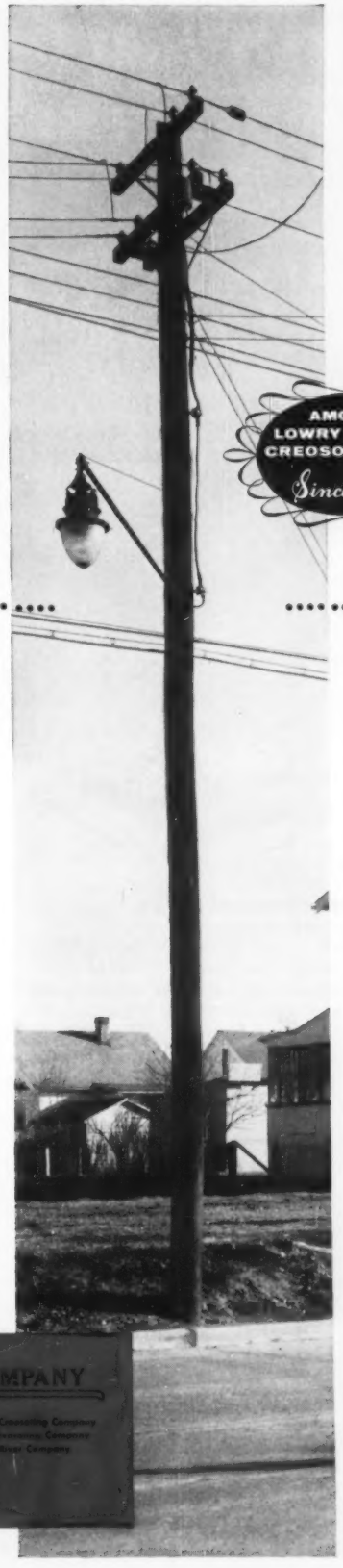
Plans Huge X-Ray

Chicago Bridge and Iron Co, builders of pressure vessels and heavy-duty weldments for industry and the nuclear energy field, has plans for one of the most powerful and versatile X-ray installations in the metals industry, according to High Voltage Engineering Corp, Cambridge, Mass.

The proposed unit will house two complementary super-voltage X-ray generators, 1 and 2 million v each.

...Toxic Creosote

Nature's Own Remedy for Longer Lasting Wood Products.....



.....For over 50 years, creosote has reigned supreme as the number one wood preservative. That's because creosote, which is actually "dead oil of coal tar," contains over 100 ingredients that are highly toxic to fungi, borers and all natural enemies of wood. Creosote is not just a simple laboratory compound, but a highly complex substance formulized by "nature" millions of years ago.

But effective as creosote may be, it still has to be applied properly for maximum results. And that's where the American Creosoting Company enters the picture.

The American Creosoting Company invented and introduced the first practical commercial method of creosote treatment. That was over fifty years ago and they have been on the job ever since. Through continuous research and development, and the experience that comes only through years of service, Amcreco can guarantee you the best in treated wood products plus the service to go with it.

Amcreco's treatment plants are conveniently located for prompt domestic or export shipment. Write your nearby Amcreco sales office for estimates or quotations on your future supplies of treated poles, cross arms, conduit and other construction wood products.

ALUMINUM
OR GALVANIZED STEEL
SUPPORT SYSTEMS
FOR POWER AND CONTROL CABLES
IN-FREE-AIR
DESIGNED AND DEVELOPED BY HUSKY PRODUCTS

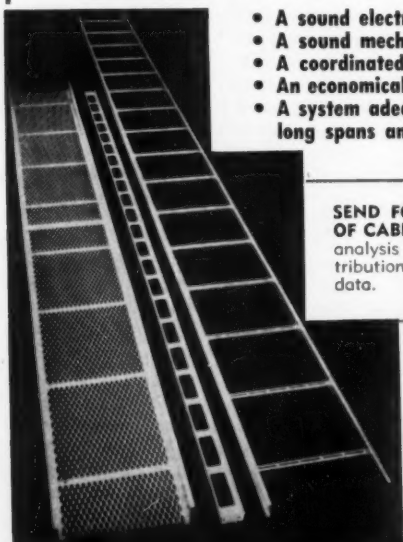
Engineers—Please remember—these famous words:—

"There is hardly anything in this world that some man cannot make a little cheaper—and a little worse. . ."

Specify:

HUSKY
OR APPROVED EQUAL

and be certain that YOUR approval gives your client:



- A sound electrical system.
- A sound mechanical system.
- A coordinated system with unit responsibility.
- An economical job—the lowest "Installed Cost."
- A system adequate for indoor or outdoors, for long spans and ideal for future expansion.

SEND FOR YOUR COPY OF "THE STORY OF CABLE IN FREE AIR". A comprehensive analysis of the modern trend in power distribution with photographs and economic data.

THE HUSKY SUPPORT SYSTEM—the only cable support system approved and recommended by all major cable manufacturers.

AVAILABLE THROUGH LEADING CABLE MANUFACTURERS

HUSKY PRODUCTS, INC.
5300 VINE STREET, CINCINNATI 17, OHIO

INDUSTRIAL BRIEFS

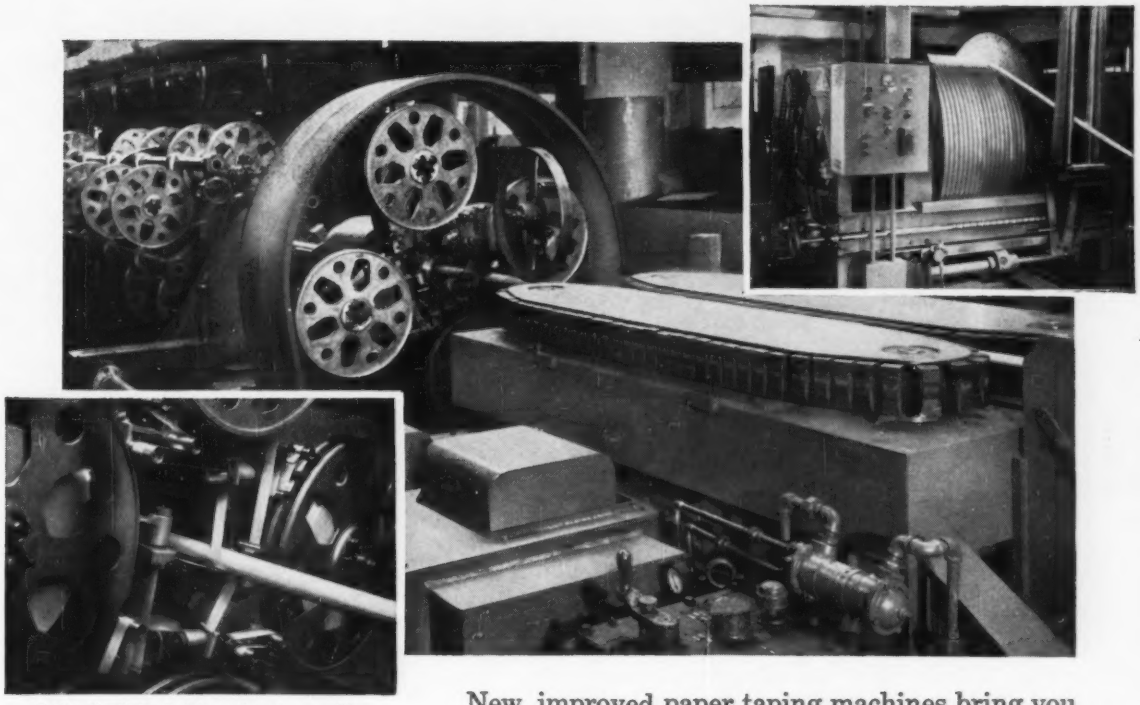
Keeping tallow molten is done at St. Louis Hide and Tallow Co through use of soil heating cable. Before cooked raw materials are sent to the press or expeller, they are put in vats for overnight settling and draining. On cool nights, the tallow formerly solidified in the associated piping before draining was complete. Eighty feet of lead-covered cable, wrapped around each 10 ft of 2-in. pipe, uncorks this bottleneck. George C. Wagner, Industrial Engineer, Union Electric Co of Missouri, St. Louis.

Four 1,000-w strip heaters were used to glue non-skid pads to the floor of a Borden's ice cream vault. Temperature in the vault stays between 6 and 8F below zero, and with the ice that accumulates on the floor the pads could not be glued to the concrete. The four 1,000-w heaters were strapped to a piece of ¼-in. steel 6 x 18 in. This was placed on the floor. Within 5 min the ice was melted and the floor perfectly dry, so that the non-skid pads could be installed. Sam Coker, Jr, Customer Service Supervisor, Texas Electric Service Co, Midland, Texas.

Cleaning dies in a hot caustic solution is done now at Capitol Products Corp, Harrisburg, Pa., without hazard to the expensive extruders. Formerly dies were scraped and wire brushed by hand—a slow, laborious, and expensive process. Company officials decided to speed cleaning through use of a caustic soda bath. Eighteen kilowatts of thermostatically controlled electric heat was applied to minimize chances of overheating the caustic solution which might damage the dies. Harry Fisler, Industrial Representative, Pennsylvania Power & Light Co, Harrisburg, Pa.

Curing adhesive on bonded automotive brake shoes takes Charles S. Palmisano of Baltimore only 5 min. His brake-bonding machines are each equipped with two 800-w strip heaters shaped to the contour of the lining. Thermostat controls assure accurate regulation of heat input and automatic electric timers turn the machines off when work is completed. He has eight of these machines, in his jobbing shop. By Ralph C. Young, Industrial Power Department, Baltimore Gas & Electric Co.

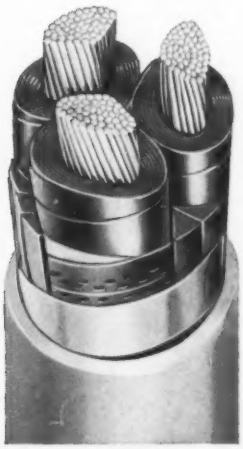
ROEBLING INVESTS IN YOUR FUTURE



MAIN PICTURE: Endview of taping machine showing caterpillar pull out

INSET AT UPPER RIGHT: Controlled tension take-up

INSET, ABOVE: Taping heads controlled tension



New, improved paper taping machines bring you far superior "paper and lead" cables

SHOWN ABOVE is one of the most modern paper taping machines in production today . . . applying tape to Roebling Paper Insulated Cables with an accuracy that brings new measures of insulating efficiency.

Outstanding features of these machines are:

★ Caterpillar pull-out which prevents distortion of paper tapes;

★ Improved gearing and "squirrel cage" machine design which eliminates backlash and insures uniformity in taping;

★ Controlled tension take-up which can be varied to suit the individual needs of each cable;

★ Controlled tension pay-off, coordinated with caterpillar pull-out;

★ Taping heads with automatic tension control.

The installation of this machine is just one part of a modernization program designed to give you paper insulated lead covered cables of outstanding dependability and service economy.

Let us consult with you on your individual cable problems. Our engineering and metallurgical staffs are always available.

ROEBLING ELECTRICAL WIRES AND CABLES ARE AVAILABLE WITH EITHER COPPER OR ALUMINUM CONDUCTORS

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 11-15 STILLING ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4801 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

Frigidaire Division, General Motors Corp photo

Air Conditioned Dugouts

Crosley Field, home of the Cincinnati Redlegs and first major league ball park to use lights, now claims to be first to have air conditioned dugouts. Job of cooling them wasn't easy. Dugouts are wide open in front and have to stay that way. A glass front was out of the question. There also could be no drafts which might chill overheated players coming in from field, or cool off pitchers' arms. Solution: A system which "encloses" dugout with 36-ft curtain of cool dry air. Designed to reduce temperatures about 10 F, it discharges air from grills along length of dugout ceiling. Players sit on bench along the rear dugout wall, about 4 ft behind the air curtain where they are free from drafts. A 5-hp water cooled condensing unit is used in combination with coil and blower unit. Ball park also boosts newly-air conditioned press box, broadcasting booth, press room, and TV monitor room.

House Heat Push . . .

. . . set by KG&E, Penn P&L; special rates offered, trade programs put in action

Two more utilities are shaping plans to push electric house heating during the coming cold season. Kansas Gas & Electric Co and Pennsylvania Power & Light Co are lining up trade ally cooperation in separate promotions.

The first, Kansas G&E, is going to offer residential and rural customers rates of 1½¢ per kwhr for heating from October through April, budget billing if desired, and advisory services on operation.

KG&E services to trade allies will include 1) calculating heat losses and estimating operating costs for dealers and for contractors; 2) construction and insulation advice to builders; and 3) all-out cooperation in promoting sales and acceptance of electric heating in homes, farms, stores, offices or factories—providing it's in the customer's best interests to buy.

The promotion will gain help from manufacturers who care to lend support. It will cover KG&E's six divisions and Wichita, the headquarters city, and aim to interest 160,000 customers.

PP&L Maps Policies

Pennsylvania P&L has eliminated the kw demand feature in its residential schedule. Its policy on heating includes cooperation with sales allies on separate room and complete building heating, both resistance and heat pump, with the standard "customer's interest" proviso. On requests of architects, builders or home owners, PP&L checks dealers' heat loss calculations and estimates on operating costs. They also advise customers on how to maintain heating efficiency.

BRIEFS

Southern Cal Heat Pumps Spread

Southern California Edison Co says it now has heat pumps in operation in 47 different localities. Systems range in size from five to 25 tons, are predominantly the air-to-air type.

New Products:

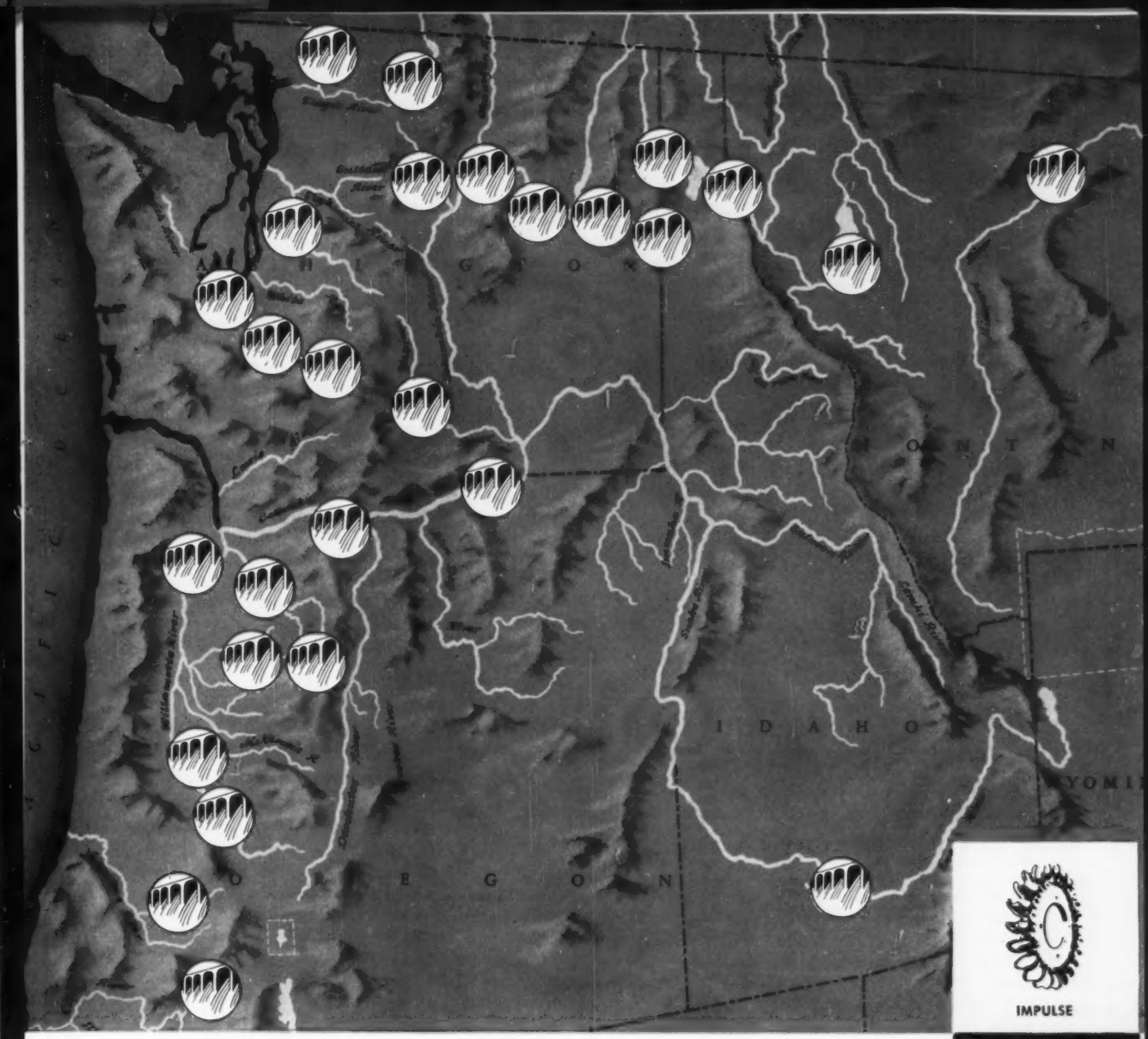
A wall-hang, plug-in, radiant glass heater, 1,000 w and thermostatically-controlled has been introduced by Can Arm Corp . . . More color has come to electric heating in small portable heater made by Electromode Corp which comes in two-tone shades . . . Heatmore, Inc now offers its radiant ceramic heaters in vertical mounted models for use in bathrooms, other rooms where wall space is limited.

Cool Forecast

Room air conditioner sales in the next five years will be about double those of 1950-55, according to Mason M. Roberts, newly-retired vice president and head of Frigidaire. In 1956, Roberts expects "a record-breaking year for the air conditioning business," with sales topping last year's peak.

Air Conditioning Specs

Engineering specifications, in reprint form, for 318 models of 1956 room, window air conditioners are available from Refrigerating Engineering, 234 Fifth Ave, New York 1, N. Y. Prices range from 25¢ each for 1-10 to 4¢ each for over 1,000.



how BLH turbines help to power the boom in our great Northwest

In the booming Pacific Northwest, rivers work harder for man than in any other comparable area in the world. BLH turbines, at 27 huge dams, are converting water power into electric power—key to the area's remarkable growth. These BLH hydraulic turbines, with over 3½ million total rated horsepower, produce more than 2½ million kilowatts every hour they run.

In addition to building all four basic types of turbines—Impulse, Kaplan, Francis and Propeller—BLH manufactures surge suppressors, valves, pumps, governors and other accessory equipment. On your next project, why not call BLH in early? For a copy of our illustrated catalog 1000, write BLH Corporation, Philadelphia 42, Pennsylvania, or Dept. 5307, Pelton Division (BLH), 2929 Nineteenth Street, San Francisco, California.

EDDYSTONE DIVISION
BALDWIN-LIMA-HAMILTON

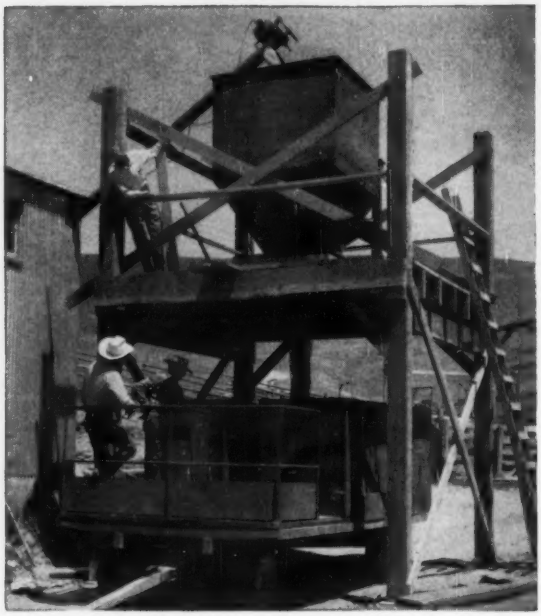
DIVISIONS: Austin-Western • Eddystone • Electronics & Instrumentation • Lima • Hamilton • Loewy-Hydropress • Pelton • Madsen • Standard Steel Works

IMPULSE

KAPLAN

FRANCIS

PROPELLER



Cattle Feeding Sped, Work Cut as . . .

Auger Replaces Toter

GEORGE WILKINSON, Farm Representative, Washington Water Power Co, Spokane, Wash.

Ranchers and farmers are prime prospects for automation. One example is an electric auger that speeds cattle feeding and eliminates the need of an extra hand for stockman Wendell Mathison, Lewiston, Wash. Feed is blended in an electric mixer run by a 5-hp motor (EW, Aug. 22, 1955, p 156), then is channeled to a 3-hp motor-driven auger which carries the feed outside the building into a 2-ton bin. Elevated about 15 ft, the bin is mounted on a floating scale so the operator can weigh all feed.

The bin provides loading space for a wagon which distributes the feed to the troughs. Specially built, the wagon has four compartments, each holding 1,000 lb of feed. By opening a gate, feed pours from the weigh bin into the wagon's sections. Small compartment gates let the feed flow out at the troughs. Controls at the wagon's front allow the driver to open gates without dismounting.

Is Time Ripe for Color TV?

RCA and Admiral say 'yes,' introduce models for less than $500. Others in industry see it coming . . . but not yet

Color television is coming, everyone admits—but when? A few hardy souls, notably Radio Corp of America and Admiral Corp, are betting on this fall. Both firms have introduced models selling a hair-line under $500. And RCA, who says market surveys show one million persons are "willing and able" to buy its lowest-priced model, plans to produce 200,000 color sets retailing from $495 to $850. Price range for Admiral is $499 to $799. A newcomer, Westinghouse Electric Corp, will introduce six "competitively priced" models with a 22-in. picture tube feature.

Practically all other manufacturers say it will be at least late 1957 before color sales really start moving. Their cautious outlook, shared by most distributors and dealers, may be altered by these recent developments:

- More and better color programming (National Broadcasting Co figures the industry will soon boost color to an 80-hr/month average, most of it on class "A" time, the premium night-time and week-end shows).
- Manufacturing improvements (Philco Corp's "apple tube" and Paramount Pictures Corp's "Lawrence tube" are touted as cost-cutting moves).
- Other retail price reductions (two Philco models priced at $595 and $695; Emerson Radio & Phonograph Co's $578, 21-in. model).
- Lagging black and white set sales (much of the slow-down, manufacturers say, is due to prospective buyers awaiting price cuts of color sets).
- Class appeal. (Officials at Florida's Americana Hotel in plush Bal Harbour say 475 rooms will be equipped for both color and black and white television. The $17-million structure opens in November.)

If one estimate on set sales is close, color TV could mean about two billion kwhr in power sales by 1960. This is based on NBC's prediction earlier this year that there will be 12 million color sets in service by then. They said that 300,000 would be operating by the end of this year.

New Sales Package Offered to Boost Home Light Sales

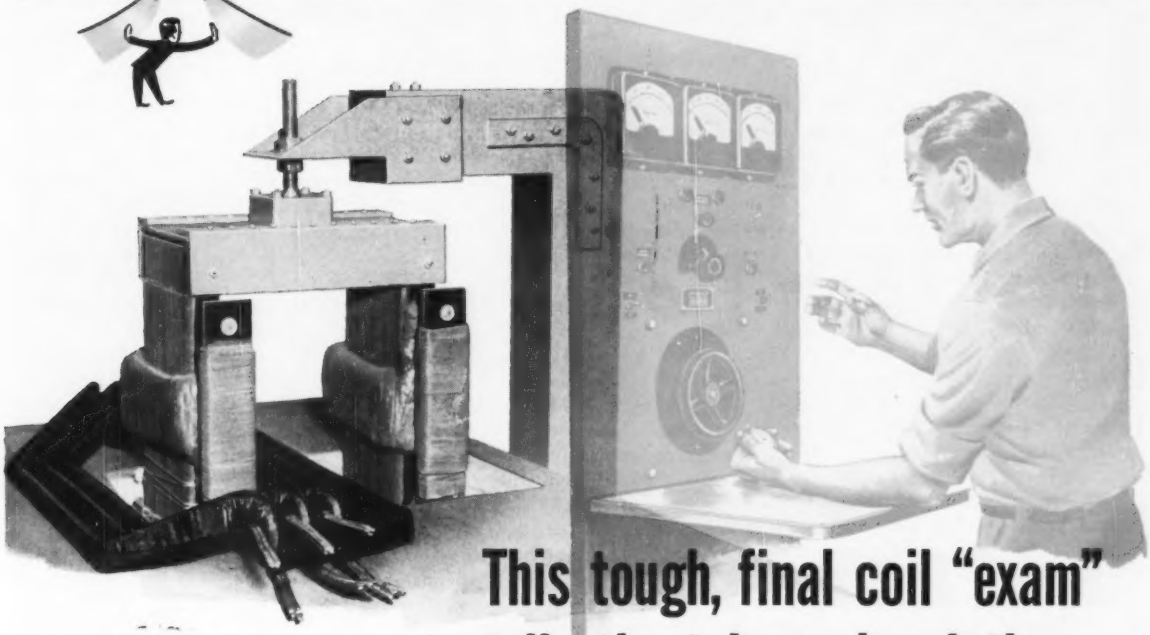
A "Light for Living" sales promotion package to up-grade residential lighting has been offered to utilities for trade ally distribution by General Electric Co. Designed for builders, fixture manufacturers and distributors, and the portable lamp field, the kits for all three include paperback editions of the best selling "How to Decorate and Light Your Home."

Written by Decorator C. Eugene Stephenson, and E. W. Commery, GE's residential lighting head, the book can be sold at a profit for 35¢ by furniture, department, fixture and portable lamp stores, GE advises. In addition to this book the sales tool kits include:

Builders Aids: Booklets with case histories, "how to's," equipment and sales aids; price, $1. **Fixtures:** Three booklets developed with American Home Lighting Institute on fixture merchandising, display and advertising plus wall and fixture guides; price $1. **Portable Lamp Kit:** Merchandising, display and advertising ideas, light-conditioning recipe book; price 50¢.

(*More S & S on page* 128)

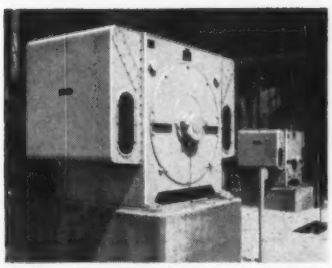
LOOK BEHIND THE "INSULATION CURTAIN" BEFORE YOU SELECT A LARGE MOTOR



This tough, final coil "exam" tells the tale on insulation

(ELLIOTT COILS GRADUATE SUMMA CUM LAUDE)

This special test equipment induces a turn-to-turn impulse voltage many times greater than anything the coil will meet in service. The slightest flaw or weakness in the insulation is instantly revealed on the test panel. It's all part of the job at the modern coil-testing laboratory at the Elliott plant. In addition to this test, many others, including all AIEE requirements, are applied to make sure every coil is fully qualified to take its place in the stator of a large Elliott squirrel-cage induction motor. The tests are tough because our standards of performance are high. Since 1948, 500,000 hp of weather-protected and 900,000 hp of indoor motors with this insulation have served *without one stator coil breakdown due to insulation failure!* That is a record that is hard to match and clear-cut evidence that you don't take a chance when you make it an Elliott Motor. Ask the Elliott field engineer for complete facts or write to the Elliott Company, Ridgway Division, Ridgway, Pa.



ELLIOTT WEATHER-PROTECTED MOTORS have a perfect seven year success record of no stator failures due to faulty insulation. The only weather-protected motor which can make such a claim.

RG-12

ELLIOTT Company

Elliott large motor insulation is "field-proven"

Associations Get Aboard LBE

Interest builds up among national trade groups; bankers promote it, home builders, NRECA send mailings

Utilities can look to stronger LBE help from national trade associations in the months ahead if performances currently being turned in are any indication. Samples:

• American Banking Association has published a lengthy LBE article in this month's issue of Banking Magazine. The publication goes to 17,500 banks and key branch offices. Also on the way by the association's public relations council is an announcement to 56 state banking organizations' secretaries detailing an electrification and wiring financing promotion, keyed to the overall LBE theme.

• American Home Lighting Institute has scheduled a promotion kit with the LBE slogan and theme which will be mailed to members for Home Lighting Fixture Month in October.

• National Association of Home Builders sent out the trade book "How to Help Home Owners to Live Better . . . Electrically" to its building industry members. In a nationally distributed trade magazine NAHB urged them to take advantage of the LBE program's opportunities in home remodeling and new construction.

• Edison Electric Institute's residential committee has two promotion kits for use by dealers and utilities. The kits include LBE banners.

• National Rural Electric Cooperative Association, with about 1,000 managers of rural co-ops on its mailing list, has sent out the LBE wiring, brochure, a catalog of other LBE material, and a letter urging members to tie in with the LBE promotion.

• International Brotherhood of Electrical Workers is featuring the program's highlights at all regional progress meetings.

• National Electrical Manufacturers Association will mail information on the big LBE October push (EW, July 16, p 15) to 360 members of the appliance and other sections of its organization.

• A four-page LBE supplement appears in the August 4 issue of "Publisher's Auxiliary" to sharpen newspaper interest in the program. The newspaper trade magazine goes to editors of dailies and weeklies who can lift material from the supplement for use in their own papers as a tie-in with the October campaign. It also shows proofs of LBE advertising and tells editors how they can get mats from their local utilities. Power suppliers will be urged to alert trade allies to the supplement and encourage its use.

Meanwhile, utilities themselves are filling in traditional summer slumps with these types of LBE activities:

• West Penn Power Co carried out a full-scale LBE Exposition in June. Seventeen dealers in the town of Tarentum, Pa. tied in with a "Beauty Pageant" of electrical appliances. Newspapers gave the free show good coverage, and a local radio station matched West Penn's spot announcements two-for-one. It even carried on live interviews with personnel who manned the booths at the show. The exposition ran for three evenings. "Meet Mrs. Swenson" was shown hourly and appliance give-aways, including a color TV set, helped hike attendance.

• Dealers and distributors in Cleveland Electric Illuminating Co's areas are making generous use of LBE banners and posters. Most of the large department stores include emblem and slogan in major appliance and electric housewares advertising. Suburban papers have carried a heavy schedule of LBE supplements and have given the program editorial comment.

• Omaha Public Power District started carrying the LBE theme Apr. 1 in all ads and promotion and will use it throughout the year. Coverage includes the Omaha World Herald, 14 suburban weeklies, 15 rural weeklies, two TV programs, one-minute radio spots on five stations, and car cards. The utility also has assigned sales personnel to follow up on trade allies and encourage them to order and use LBE materials.

• A 12-page dealer program folder published by Columbus & Southern Ohio Electric Co tells of 20 sales and promotion aids it offers dealers. It describes how appliances sales can earn "electro-bucks" good for ball games and other prizes.

• Wisconsin Electric Power Co staged a "Hunt and Name Your Electric Bill" contest that carried the LBE slogan. The utility uses the promotion material in daily "Mary Modern" TV show, car cards which advertise its "Wire-on-Time" plan, and radio and newspaper ads.

• Ohio Power Co has ordered more than 1,000 LBE banners as well as several thousand dealer and contractor decals. It has put large LBE decals on every one of its trucks and passenger cars.

• Union Electric Co of Missouri reports that well over 100 dealers and distributors in its area have ordered LBE materials.

S & S SHORTS

Going . . . Going . . . Gone!

Rural electric co-ops in Arkansas will get an added fillip at annual meetings this year. Automatic washers, water heaters, freezers and fans will go on the auction block to help dramatize how electricity makes for happier farm life.

More Light from Duke

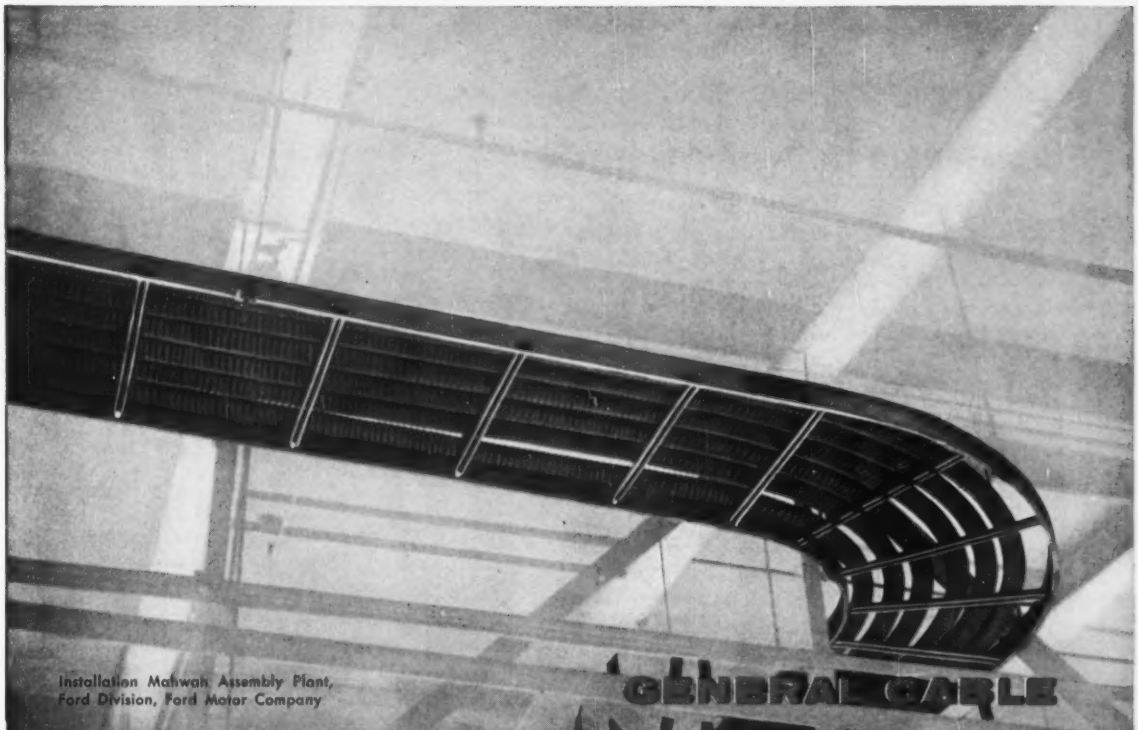
Duke Power Co is now about 60% finished with a new $350,000 street lighting job in downtown Greensboro, N. C. Some 535 mercury vapor lights will increase illumination about five times over present incandescent units.

Low-Voltage, High Speed

A 110-v clothes dryer said to dry clothes 2½ times faster than other low voltage models has been announced by Monitor Equipment Corp. Unit dries the moisture-laden clothes with jet of heated air.

TV Replacement Sales Grow

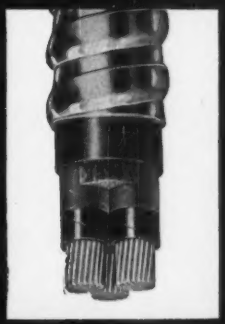
More than 31% of the 7.45 million television sets sold last year were replacements, says Radio-Electronics-TV Manufacturers Association. And the trend is growing. RETMA says replacement set sales in 1954 amounted to 22% of total sales.



Installation Mahwah Assembly Plant,
Ford Division, Ford Motor Company

INTERLOCKING ARMORED CABLE

SAFE · DEPENDABLE · ECONOMICAL



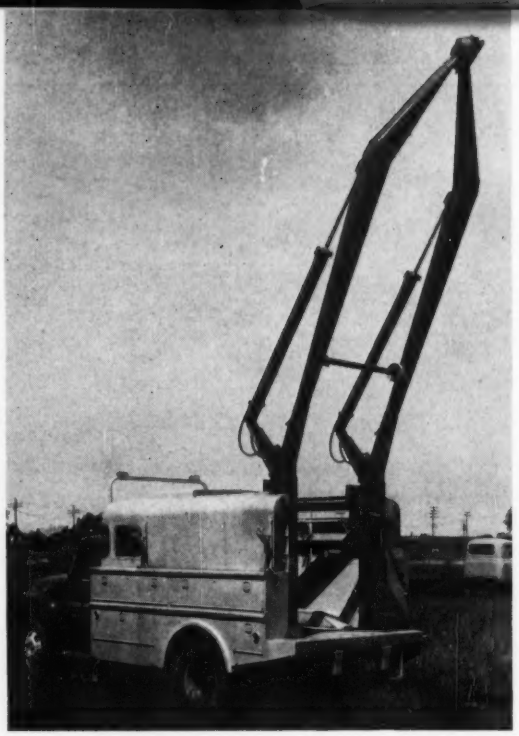
Modern engineering design and superior flexibility impart *extra long life* to GENERAL CABLE'S INTERLOCKING ARMORED CABLE. Available in ALUMINUM, BRONZE and STEEL TAPE ARMOR, with every type of insulation for all power applications. Lighter weight and easier to install.

GENERAL CABLE CORPORATION, 420 Lexington Avenue, New York 17, N. Y. Offices and Distribution Centers Coast-to-Coast.

BE SPECIFIC...SPECIFY GENERAL CABLE

NEW EQUIPMENT

Live-Boom Hydraulic Derrick

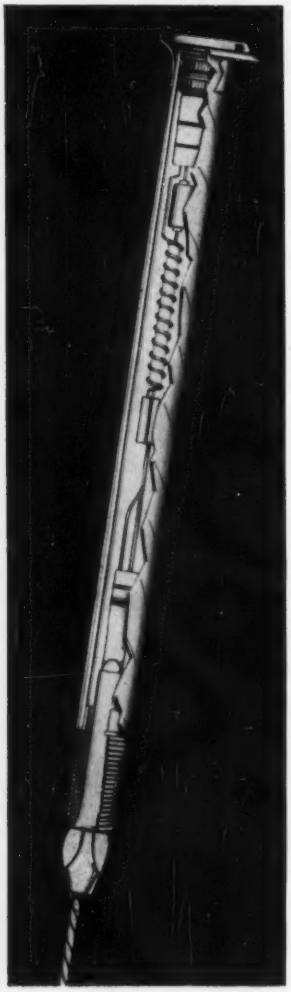


Two-legged, live-boom hydraulic derrick has an operating range of 195 deg. Fabricated, rectangular side legs are said to be light, strong and proportioned to provide uniform unit stress in both planes.

Two standard sizes are available: A 23-ft derrick for poles up to 55 ft, and a 26-ft derrick for poles up to 65 ft.

Designated Series 6,700, the derrick reportedly lifts 2,500 lb to rear platform for body loading. Numerous lifting positions are available from live-boom action by a single drum winch. The series is rated 8,000 lb and has been tested at 14,000 lb, manufacturer reports.

J. H. Holan Corp, 4100 W. 150th St, Cleveland 11, Ohio



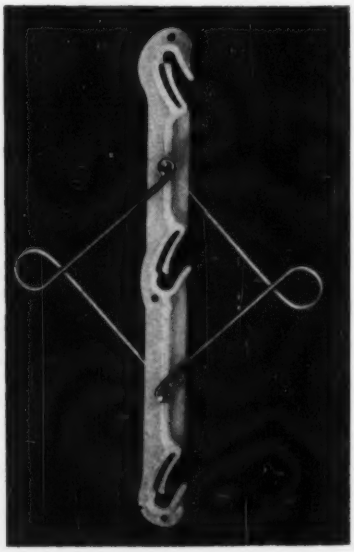
Dual Element Fuse Links

Made in 18 sizes for distribution transformers from 1.5 to 75 kva, a line of fuse links is said to reduce transformer burnouts while permitting them to operate at full capacity. Fuse links are designed to permit transformer's operation at full overload capacity and protect against overloads exceeding ASA safe loading standard, manufacturer claims.

Designated Slo-Fast Fuse Link, the device features a dual fuse element, one portion of which is slow, the other fast. Manufacturer claims the fuse link's time current characteristic curve is almost identical to that of ASA's safe loading curve for distribution transformers. This is said to avoid overloads which might cause transformer damage.

A. B. Chance Co, Centralia, Mo.

Vertical Spacer



This one-piece "between-poles" spacer is designed for vertical secondary circuits and "mid-span" service taps. It is said to provide added spacing between poles that carry live, uninsulated conductors and permits service drops without erecting poles.

Features include quick conductor installation in hooks with resilient triggers, spring-lock of bails' steel wire halves, and construction of acrylic resin. Double construction of bails allows service taps to be made on either or both sides, manufacturer reports. Spacer accommodates up to 0.580 in.

Hendrix Wire & Cable Corp, Dept P, 19 Watson St, Boston 18, Mass.

(*More New Equipment on page* 132)

"No failures from weathering in over 65 million feet of NEOPRENE-covered wire and service drop cable"

SAYS PUBLIC SERVICE ELECTRIC AND GAS COMPANY

It's a fact . . . you can't beat neoprene covering for dependable service on wire and cable. The experience of the Public Service Electric and Gas Company of Newark, N. J., is a good case in point.

Since 1945, Public Service has used over 65 million feet of neoprene-covered overhead conductors . . . and today is installing over 18 million feet of neoprene-covered line wire and service drop cable yearly.

Despite exposure to all types of atmospheric conditions —including heavy industrial and chemical fumes in many of the areas served—neoprene covering is giving the long service expected. Public Service reports: "*No failures to date due to aging or weathering.*"

Like Public Service, you can count on extra-long service from neoprene-covered wire and cable. In addition to its resistance to weathering and chemical attack, neoprene withstands oil, grease, and ozone. Your savings in maintenance and replacement costs start from the day neoprene goes on the job.

Be sure of the best covering for your conductors . . . the best investment for long-term performance. Ask for covering of Du Pont neoprene.

NEOPRENE

The rubber made by Du Pont since 1932

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . THROUGH CHEMISTRY

MAIL THIS COUPON TODAY!

FREE! THE NEOPRENE NOTEBOOK. Every issue contains interesting stories about products made with neoprene. Actual case histories give you the facts about neoprene's longer service life. Clip this coupon to get on the mailing list.

E. I. du Pont de Nemours & Co. (Inc.), Elastomers Division EW-8
Wilmington 98, Delaware

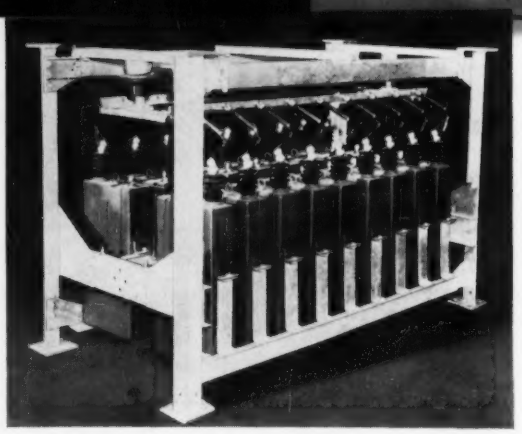
*Name*_____ *Position*_____

*Firm*_____

*Address*_____

*City*_____ *State*_____

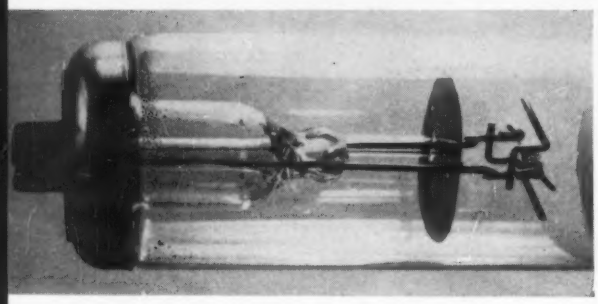
50-Kvar Capacitor Blocks ▸



Capacitor blocks for use with 50-kvar units in open-type banks at transmission, subtransmission and distribution voltages are said to require about half substation area used by 25-kvar blocks. Manufacturer claims blocks facilitate changes in bank size and voltage rating as varying system conditions require.

Standard block has two rows of 50-kvar units, 5 or 8.7 kv, connected in parrallel in frame of standardized sizes. Capacities are 400 through 1,200 kvar.

Line Material Co, 700 W. Michigan, Milwaukee 1, Wis.

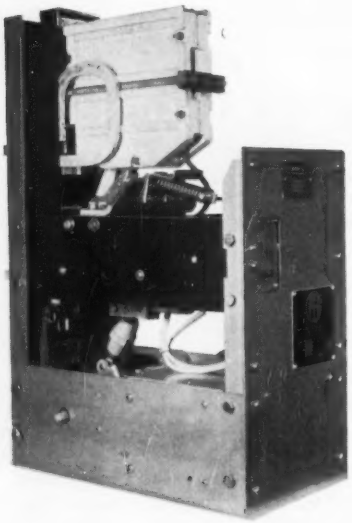


◂ Fluorescent Lamp

Four main features are claimed for a fluorescent lamp, which is designated VHO: **1.** Efficient lamp diameter, **2.** rapid start continuous filament heating, **3.** control of operating pressures and temperatures, and **4.** use of neon gas instead of argon. Cathode assembly, shown at left, is described as a new design concept permitting very high output.

Lampholder design incorporates "back to back" spacing used in manufacturer's HO line. First models are 4-ft, 100-w lamp rated 6,200 lumens and 8-ft, 200-w model of 13.250 lumens, initially available in "cool white."

Sylvania Electric Products, Inc, 1740 Broadway, New York 19, N. Y.



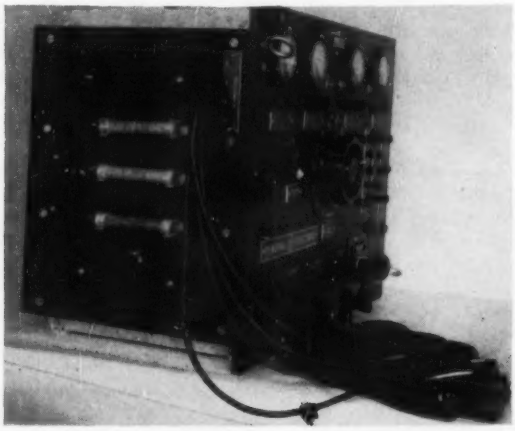
◂ High-Speed DC Circuit Breaker

Current-limiting, high-speed dc circuit breaker is described as operable at 1,000 v and 1,200 amp continuous. It is designed to interrupt in 0.012 sec, limit current magnitude in 0.004 sec, and to trip on forward or reverse current.

Designated FB-12, the breaker is built in single and multiple pole assemblies, each with an individual closing motor, and is wirable for individual or automatic reclosing.

I-T-E Circuit Breaker Co, 19th & Hamilton, Phila. 30, Pa.

Network Protector Test Set ▸



Featuring compactness and one-man operation, this network protector field test set makes calibration tests on relays, control devices and motor mechanism.

Designed for testing both 125/216 and 277/480 v applications, the set takes power from secondary bus of the network by means of clip-on cables.

General Electric Co, Schenectady 5, N. Y.

(*More New Equipment on page* 137)

YOU GET MORE

Extra
Value
Features

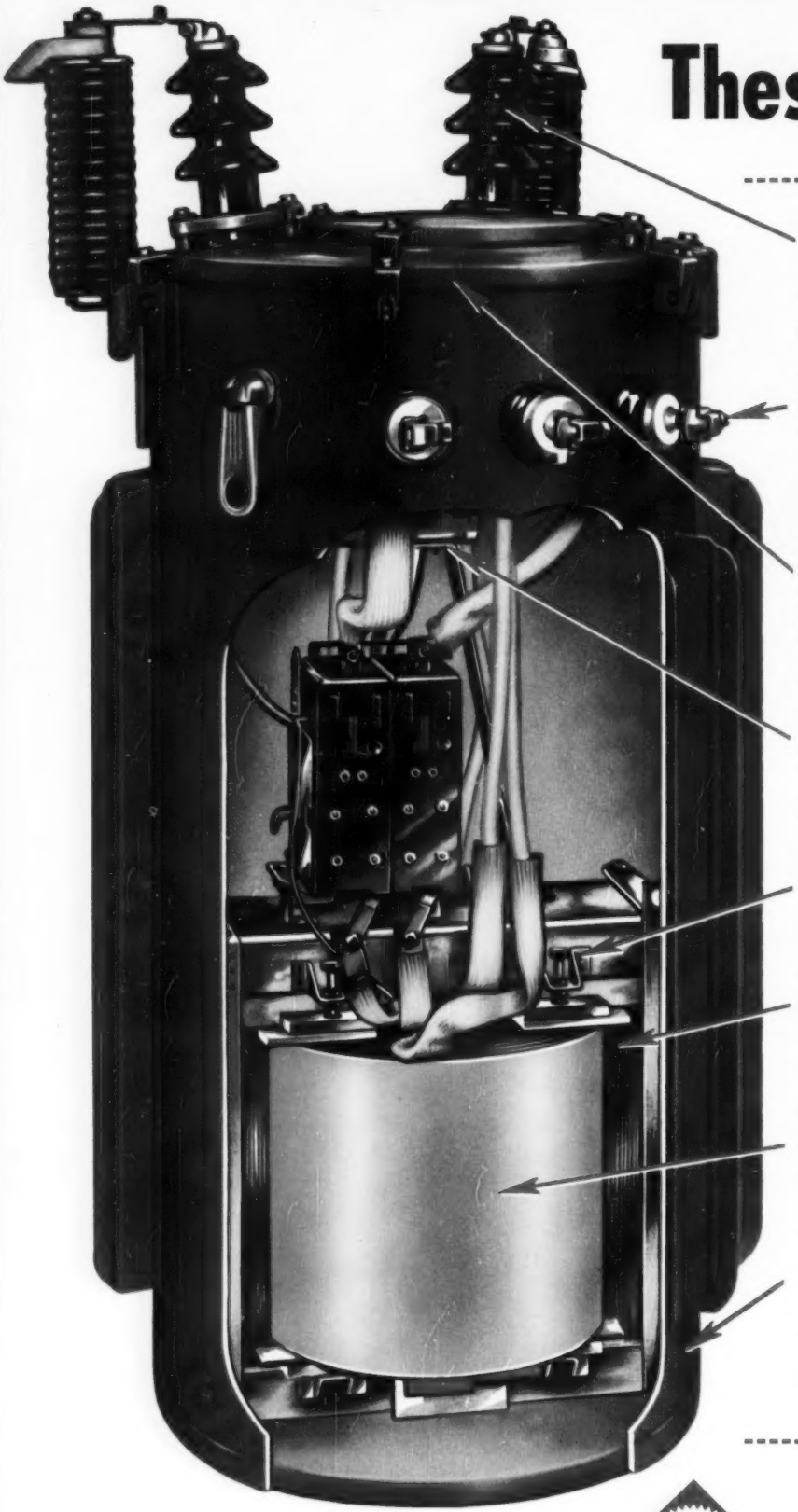
IN ALLIS-CHALMERS

Distribution Transformers

ALLIS-CHALMERS

A-5068

These Quality



Time-saving, easy-connecting high voltage bushing accommodates any EEI-NEMA conductor size. Bushing is radio-interference free. Terminal assembly keyed to porcelain to prevent gasket movement or shearing.

Double-keyed low voltage bushing gives positive protection against rotation, eliminates possibility of internal short circuit. Corprene gaskets are fully retained . . . are compressed without twist or shear. Tinned clamp-type connectors permit use of either copper or aluminum.

Precision-fitted, positive-seal cover is oil and air tight. Tank is effectively sealed with permanent type, fully retained gasket. Captive cover clamps save time, too — they can't fall to the ground during inspection or periodic maintenance.

Easy-to-read indicator plate marks tap-changer position. Operating handle and indicating plate are well above oil level. Porcelain base increases dielectric strength and tracking resistance.

Adjustable-type coil supports lock coil firmly and safely into position. Pads under support are specially compounded for strength, give even clamping over coil width.

Low losses . . . low exciting current . . . improved regulation with compact *Curvacore* construction. High quality, preferred oriented cold-rolled core steel is used. Core loops are carefully matched.

Oven-dried assembly insures low insulation power factor. Each coil is thoroughly dried and then tanked while still hot to prevent moisture penetration.

Machine-welded, heavy gauge sheet steel tank is made to be as maintenance-free as possible. Tank bottom is recessed with straight wall construction inside and out — no place for condensation or water to collect.

Curvacore is an Allis-Chalmers trademark.

A-C ALLIS CHALMERS

ALLIS-

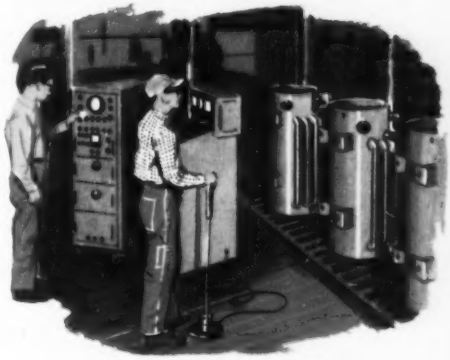
Features Make Allis-Chalmers Your Best Transformer Buy

Controlled Quality Means MORE Transformer Value

Production checks assure quality throughout Allis-Chalmers distribution transformers. From the heart of the transformer — the core steel — to the bushing terminal cast connectors which receive a severe mercurous nitrate test, all component parts are carefully inspected and tested.

Mechanical inspection and electrical tests are conducted at various stations along the production line to maintain rigid engineering specifications.

Even the thickness of paint is measured under the Allis-Chalmers Quality Control Program. Exclusive hot-spray paint process insures long paint life with minimum maintenance.



Production line impulse testing is one of the final steps in Allis-Chalmers Quality Control. Regardless of size or voltage, every Allis-Chalmers distribution transformer brings you this seal of quality.

SEE FOR YOURSELF

All the features and advantages of Allis-Chalmers distribution transformers are graphically, conveniently explained with the Allis-Chalmers "Visualizer." Call your nearby A-C district office and ask to see it. Or write to Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin, for complete information.

CHALMERS

ALLIS-CHALMERS

NETWORK TRANSFORMERS

Space-Saving Solution To Network Problems

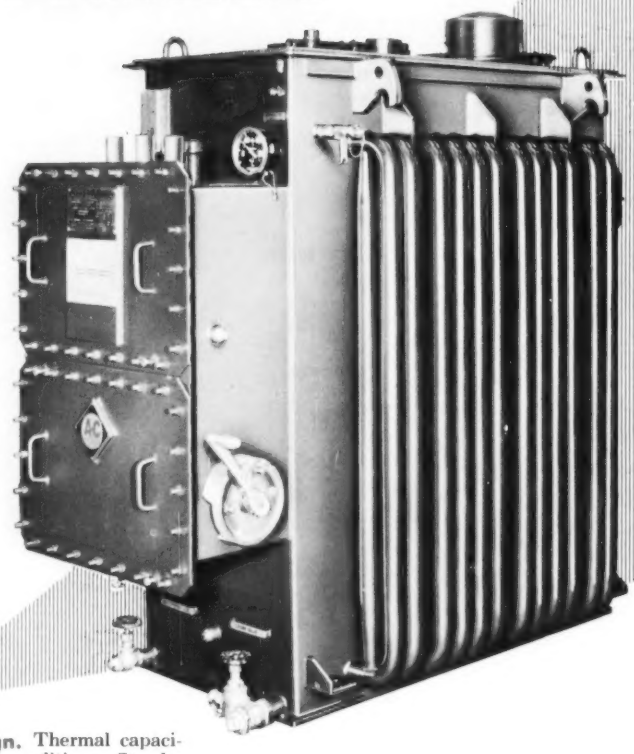
COMPACT design means savings in high-cost space when you use Allis-Chalmers network transformers. Utilities all over the country are choosing Allis-Chalmers as increasing loads put more demands on their downtown network systems. New Allis-Chalmers units are ordered repeatedly to take their place alongside the more than 1½ million kva already installed.

You get unusual flexibility in choice. To simplify application problems, Allis-Chalmers builds all three types: oil-filled, *Chlorextol* liquid-filled, and sealed dry-type.

Investigate all the advantages of compact, reliable Allis-Chalmers network transformer design. Consult your nearby A-C district office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.

A-4781

Chlorextol is an Allis-Chalmers trademark.



Compact, low-loss design. Thermal capacities are high for severe load conditions. Sturdy, time-proved core and coil construction withstands repeated short-circuit stresses of network operation.

Safe, dependable tap-changing mechanism. Handle inserted through two-inch opening on cover operates mechanism. Handle cannot be removed unless it is in positive tap position. Cover location of handle entrance eliminates packing gland maintenance.

Threaded valve connections to tank are solder-wiped for extra protection. Valves are located for easy access. Globe-type valves with nonrotating seats close tight, avoid wear on valve seats.

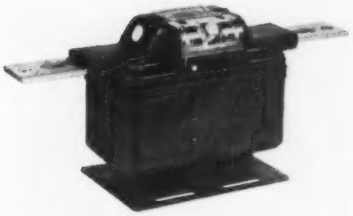
Spiral-wound gaskets have proved their superiority over other types of gaskets for sealing bushings in the tank wall in over 7 years' continual use. Alternate plies of preformed spring-like metal and nonmetallic fillers provide unusual resilience and actually adjust themselves to changes in operating conditions. Gaskets can be installed without cements or grease. They can be quickly removed if required and may be re-used.

Shot blast cleaning, three coats of baked-on paint formulated for high water resistance, and protective compound treatment of base and tubes in base area give superior surface treatment.

A-C ALLIS-CHALMERS

ALLIS-CHALMERS

LIVE BETTER ELECTRICALLY



Instrument Transformer

A butyl-molded type 8,700-v indoor current transformer operates meters, relays and control devices. It is available in standard single-primary current ratings from 10 to 800 amp, and all ratings have single 5-amp secondary, manufacturer reports. Frequency rating is for 25 to 60 cycles.

Designated JKM-4, transformers with primary ratings of 10 to 600 amp reportedly can be operated continuously at 150% of rated current and the 800-amp model at 125% of rated current, without exceeding allowable rise of 55C above a 30C ambient. Meter accuracy is ASA Class 0.3 and ASA relay accuracy class is 2.5H100 at 60 cycles. An auxiliary mounting plate gives height conformance to larger prior model.

General Electric Co, Schenectady 5, N. Y.

Utility Plier

Featuring a box joint which provides a grip without sideways twist or strain, this plier is said to grip flat, square, hex or round objects like a pipe wrench. Called Crestogrip, the tool is described as not being a "slip-joint" plier and should not be confused with "pump" pliers. The Crestogrip reportedly adjusts in four positions up to 1½-in. capacity.

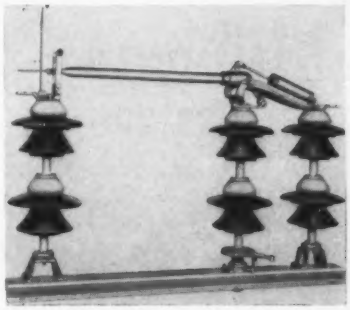
Crescent Tool Co, Jamestown, N. Y.

Cable Splicing Kits

A series of three splicing kits for casting in-line cable splices in epoxy resin features a split-mold design. For field work, the plastic mold halves snap together around the cable, resin is poured into mold and splice is completed in less than 10 minutes, according to manufacturer.

A plastic envelope container holds an epoxy resin and an activator in two compartments. When kneaded, the container's contents mix and are ready to pour. Designated Scotchcast, the splicing kits are said to handle wires and cables from ½ to 1⅞-in outside diam.

Minnesota Mining & Mfg Co, Dept D6-152, St. Paul Minn.



Vertical-Break Switch

A Type HI switch, this vertical-break, rotating-stack, group-operated air-break switch is said to conform to applicable AIEE and NEMA standards. Features reportedly providing smooth, easy operation include three-moving-parts blade-actuating mechanism; lubricated bronze bearings on live parts; and greaseless ball bearing assembly for rotating insulator.

Switch has braidless, sealed jaw contacts. It is available for upright, vertical or underhung mounting. Manufacturer reports the switch is adaptable to most substation requirements and other applications. Ratings range from 7.5 to 69 kv; 400, 600 and 1,200 amp.

A. B. Chance Co, Centralia, Mo.

Control System

The step motor in an automatic control system is said to permit a multiple series of operations to be programmed on tape or punched cards for automated milling machines, lathes, grinders and drills. Manufacturer claims three or more units can be tandemed for multiple machine tool operations.

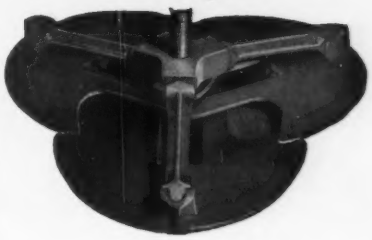
Teller Co, Butler, Pa.

(*More New Equipment on page* 138)

The Old Reliable

EVERSTICK ANCHORS...

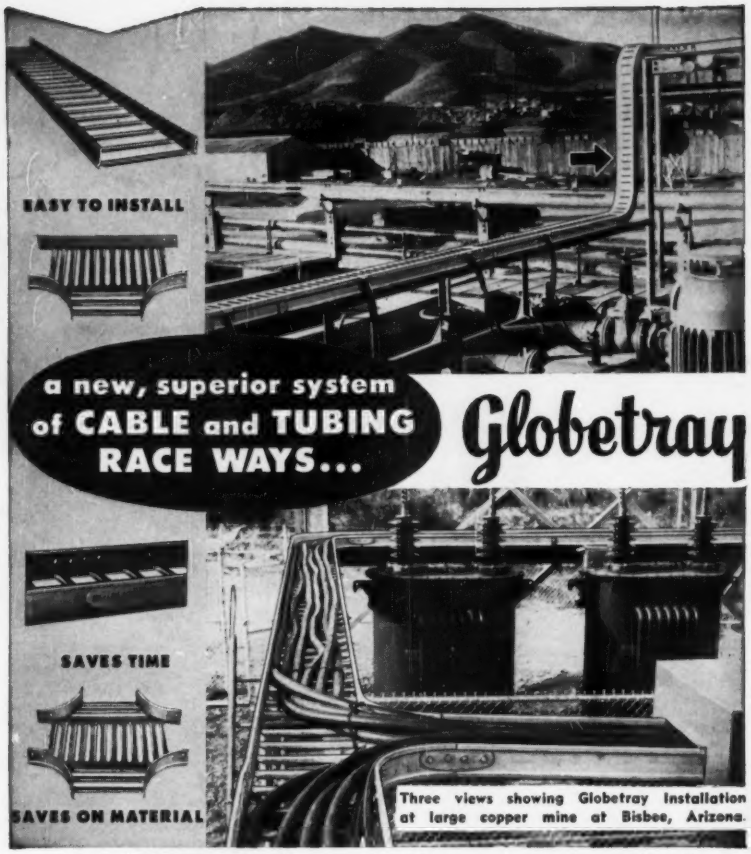
EXTRA Holding Power
QUICKLY Installed
TOUGH For long life



● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

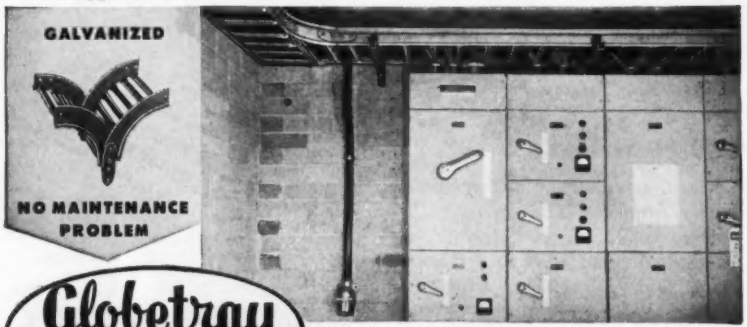
AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA



A completely engineered system of cable ways, production produced and die formed for uniformity with up to twice the strength of ordinary trays, by actual laboratory tests. The universal splice plate joins all parts through the side channels only. All curved fittings are joined at the end of the radius (no tangent material is required) permitting continuous curves. This feature provides greater flexibility of application in tight places and creates an endless variety of combinations for a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings.

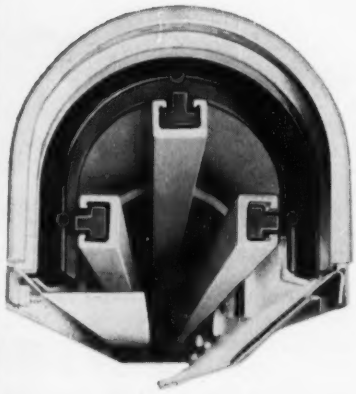
Comes in 6", 12", 18" and 24" widths, in standard 12' lengths to further speed up installation time. Cable way can be cut to length at any point – insides and bottom always smooth – all sections punched for easy installation – perfect fit at all times. Neat, clean and uniform in appearance.



Write for new complete catalog. Distributors in all principal cities. Contact the Grip-Strut distributor under "Conduits" in the classified telephone directory.

Manufacturers Since 1914 **The GLOBE Company**

4030 S. PRINCETON AVE. • CHICAGO 9, ILL.

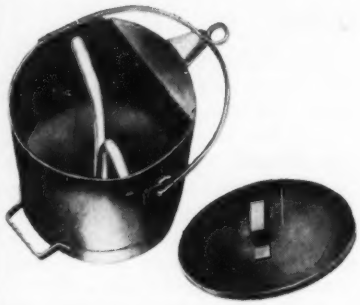


Trolley Bus-Way System

Available in 100, 200 and 300-amp capacity at voltages up to 575 ac or 250 dc, an enclosed trolley bus-way system supplies power to cranes, hoists, welding equipment and other moving units. Track sections are 30 ft long, which reportedly reduces joints and installation time.

Three aluminum bus bars, arranged in delta pattern, are enclosed in aluminized steel housing. Bottom safety covers are said to prevent contact from below with current carrying members. The system is known as Lec-Trol-Feed.

Electric Service Mfg Co, 17th & Cambria Sts, Philadelphia 32, Pa.

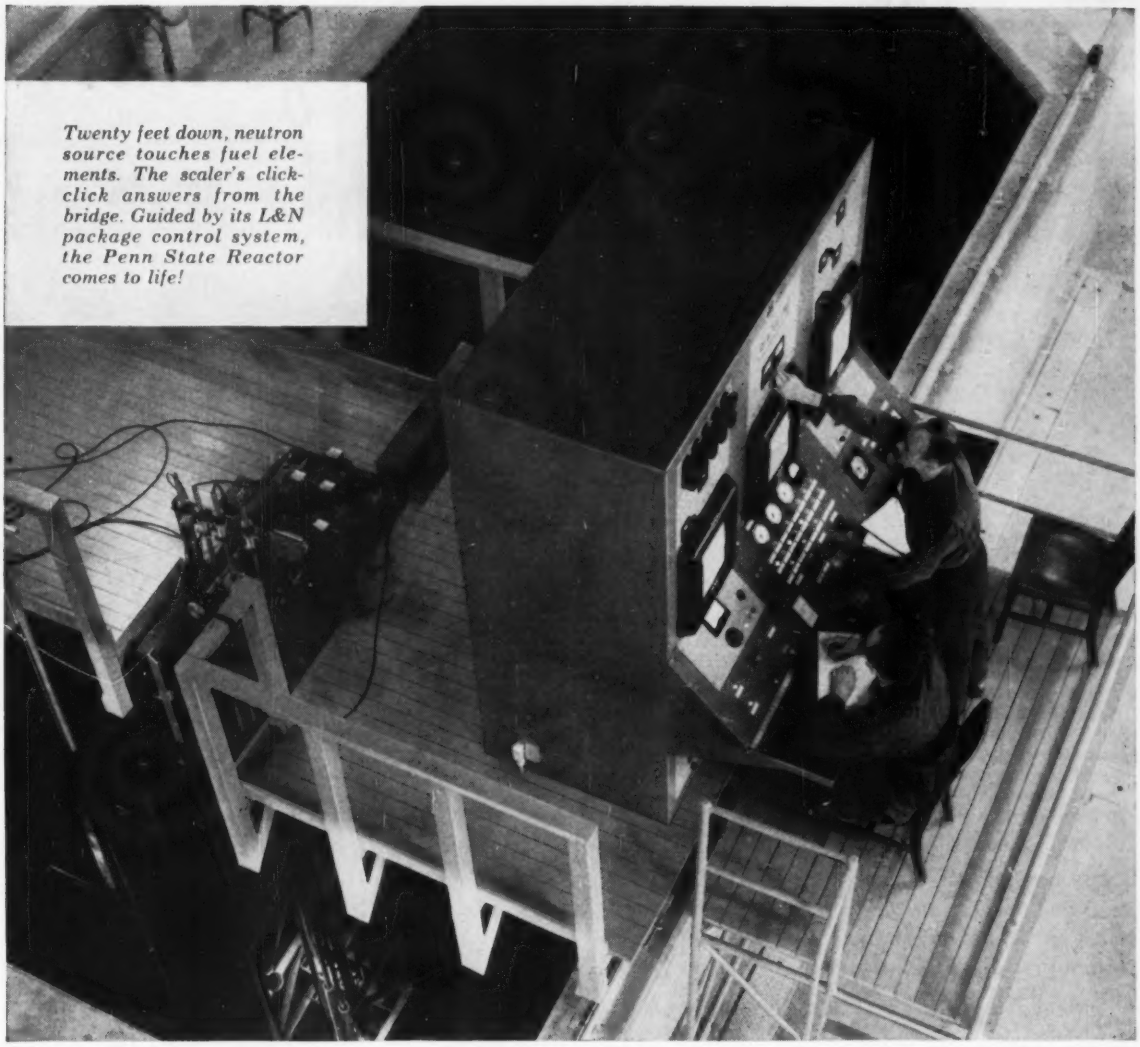


Compound Kettle

Features of steel compound kettles include double flues that conduct heat to provide uniform melting, short lip for easy pouring, and wide mouth for easy filling, manufacturer claims. It is available in 1, 1½ and 3-gal sizes weighing 6, 7 and 10 lb, respectively.

T. J. Cope, Inc, Collegeville, Pa.

(*More New Equipment on page* 142)



Twenty feet down, neutron source touches fuel elements. The scaler's click-click answers from the bridge. Guided by its L&N package control system, the Penn State Reactor comes to life!

L & N "PACKAGE" CONTROL SYSTEM simplifies reactor operation at Penn State

From initial scaler response to final scram, Penn State's PSR Research Reactor is regulated by an L&N "package" control system—the first ever produced for a nuclear reactor.

The package includes not only instrumentation and the control cubicle, but all the intangibles—design services, engineering consultation, and coordinated planning—so important to the success of the system. This is an approach possible only with L&N's nuclear and power plant experience, coupled with a complete line of standard L&N instruments that can control a reactor without costly and elaborate customizing.

For instance, standard Speedomax recorders chart log count rate and log N. The linear level Speedomax includes the P.A.T. Control Unit so well-known to industry. This linear servo amplifier feeds an output to a conventional L&N Drive Unit to position the control rod when the operator switches to "auto" after the PSR goes critical.

You'll hear more about L&N package control in Livermore Lab's LPTR, and University of Michigan's FER, to mention only two. The principles involved are outlined in our booklet "Control Systems for Nuclear Reactors." Write Leeds & Northrup Co., 4938 Stenton Ave., Phila. 44, Pa.

LEEDS & NORTHRUP
instruments *automatic controls* • *furnaces*

The New Johnson & Johnson ...another TRIANGLE VCI* Installation!

WORLD'S LARGEST
The new J & J plant for manufacturing surgical dressings and baby products will be the largest of its kind. It is being built with plenty of room for expansion on a 275-acre tract in North Brunswick, N. J. Present program totals 600,000 sq. ft. with occupancy scheduled for the Fall of 1956. General Contractor is Walter Kidde Constructors, Inc., Electrical Contractor is James H. De Laplaine, Inc., Highland Park, N. J.

*Varnished Cambric Insulated Interlocked Armor Cable

Johnson & Johnson is expanding again. The Company, long famous for quality products and high standards of building design, functional efficiency, and consideration for the welfare of their workers, was faced with a pressing need for additional space.

They needed a modern, expansible plant, constructed with the very best materials. And, to feed the extensive system of branch circuits, the electrical requirements called for a flexible high voltage distribution system which could be cut into for future needs.

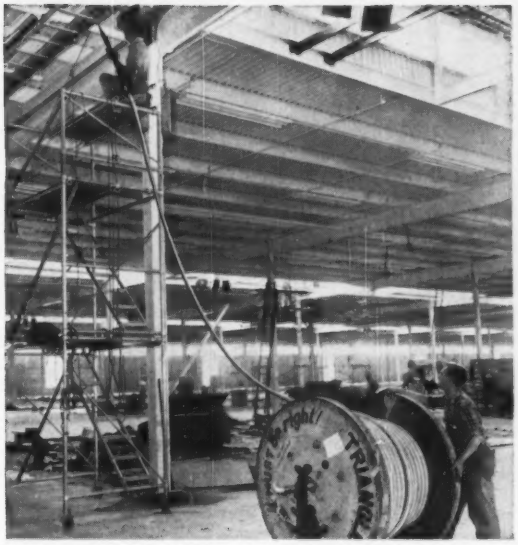
Engineers from Walter Kidde Constructors Inc., who designed the plant, specified VCI Cable (Varnished Cambric Insulated Interlocked Armor Cable) as the most practical and economical material for the job. That's where Triangle VCI came into the picture.

A COMPLETE TRIANGLE JOB —more than 150 miles of TRIANGLE wire and cable were used and more than 40 miles of TRIANGLE Conduit

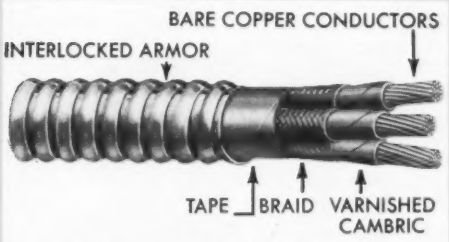
And with good reason, too:

1. *VCI IS DEPENDABLE*... Designed specifically for power distribution systems, the flexible built-in armor gives it ample protection. Also, voltage drop is somewhat less than for "conventional" installations.
2. *VCI SAVES SPACE*... For most installations VCI requires less than half the space needed for conventional methods.
3. *VCI SAVES LAYOUT TIME*... In most cases, no detailed layouts of cable runs are necessary. Installation can be easily changed to meet machine relocation or expansion needs.
4. *VCI SAVES INSTALLATION TIME*... Takes less than half as many man-hours to install. Gets around obstructions without conduit bends or pull boxes.

Manufacturing Center!

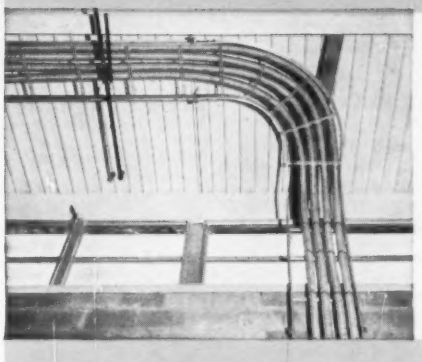


Long sections of Triangle VCI, Interlocked Armor Cable are quick and easy to install—and can be spliced, tapped, or terminated using readily available potheads and junction or splice boxes.



Varnished Cambric Insulated **Interlocked** Armor Cable
(Underwriters' Laboratories Type ACV)
Two, Three and Four Conductor Assemblies
#4—750 MCM
600—5000 Volts

Triangle VCI Cable goes around obstructions and corners, on racks hung from the ceiling.



Triangle VCI should be secured at intervals not greater than 4½′ apart. The minimum bending radius can be as sharp as 7 times the diameter of the cable.

Power is brought in underground from the sub-station and connected through Triangle rigid conduit to cable.

See your Triangle distributor for information on the complete line of Triangle Conduit and Cable. Write us for catalog and specification data.

YOUR DISTRIBUTOR IS THE BEST FRIEND YOUR BUSINESS CAN HAVE!

It Must Be Right
The Trade Mark of TOP Quality
TRIANGLE
"IT MUST BE RIGHT!"

TRIANGLE CONDUIT & CABLE CO., INC.

NEW BRUNSWICK, NEW JERSEY

Manufacturers of Arteries for Electricity, Liquids and Gases

WIRE • CABLE • CONDUIT • PLASTIC PIPE • BRASS AND COPPER TUBE

COPE EXPANDED METAL CABLE TROUGH THE LOWEST INSTALLED COST OF ANY CABLE SUPPORTING SYSTEM

Cope Expanded Metal Cable Trough is installed in 90% of all major U. S. utilities and is used widely throughout industry.

Note these advantages that are unique with Cope Expanded Metal Cable Trough:

Labor Savings. Quick, simple connections mean faster installation, reduced labor costs. Exclusive Cope Pin-Type Coupler uses only two steel pins and a bottom plate per connection.

Materials Savings. Since far less steel is required than for most types of supporting systems, you save quantities of steel. And fewer, lighter supports are needed.

Improved Electrical Properties. Cope Expanded Metal Cable Trough allows higher cable current ratings. Some engineers allow free air ratings, and all allow higher ratings than are permitted with a solid, enclosed support.

Maintenance Savings. Cable is available for inspection and repair when it is laid in Trough. Insulation is saved by allowing the generated heat to escape and also by greatly reducing frictional wear when cable is installed.

Greater Flexibility. Cope Trough is the most flexible system of cable supports ever designed. A complete line of standard fittings simplifies side runs, drop-outs, last minute changes, plant expansions.

Space Savings. Cope Trough saves space by reducing materials. Confusion is reduced during installation because connections are simpler.

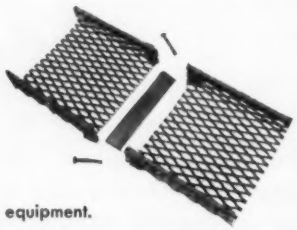
Other Cope Products to Help Simplify Your Jobs:

Cope Cable Ladder is the simplest and least costly system for the support of armored and other semi-rigid cables.

Cope Cable Channel for branch runs is readily tied in with Trough or Ladder System. Both Ladder and Channel incorporate exclusive Pin-Type Coupler.

Cope Rakit Supports are designed specifically for the support of Cope Ladder, Channel, and Trough Systems. Available either with trapeze or the more popular cantilever supports.

EXCLUSIVE COPE PIN-TYPE COUPLER greatly simplifies installations, reduces installation costs, and provides greater adaptability. Pin is driven into interlocking barrels and rigidly secures the connections. Bottom plate protects cable at Trough connections.



Cope Standard Line is a complete line of underground cable installation equipment.

Specify Cope Products for Quality. Our engineers are ready to work with you.

T. J. COPE, INC.

COLLEGEVILLE 4, PA.

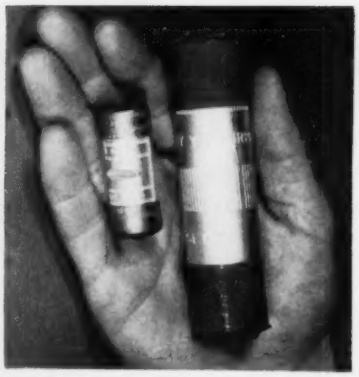
Cope

GROUND TENTS

ROD GRAPPLES

CABLE REEL JACKS

PNEUMATIC FISHLINE



Compression Connectors

Line of compression connectors has been expanded to accommodate conductors for 2/0 through 4/0 copper, aluminum and ACSR, manufacturer announces. Called Linkit, the connector is made of aluminum tubing and factory-filled with oxide-penetrating and corrosion-inhibiting compound for aluminum and aluminum-to-copper. It reportedly lets lineman make connections at both the pole and customer end of drop wire without die changes. New size is seen at right. **Burndy Engineering Co, Inc, Norwalk, Conn.**

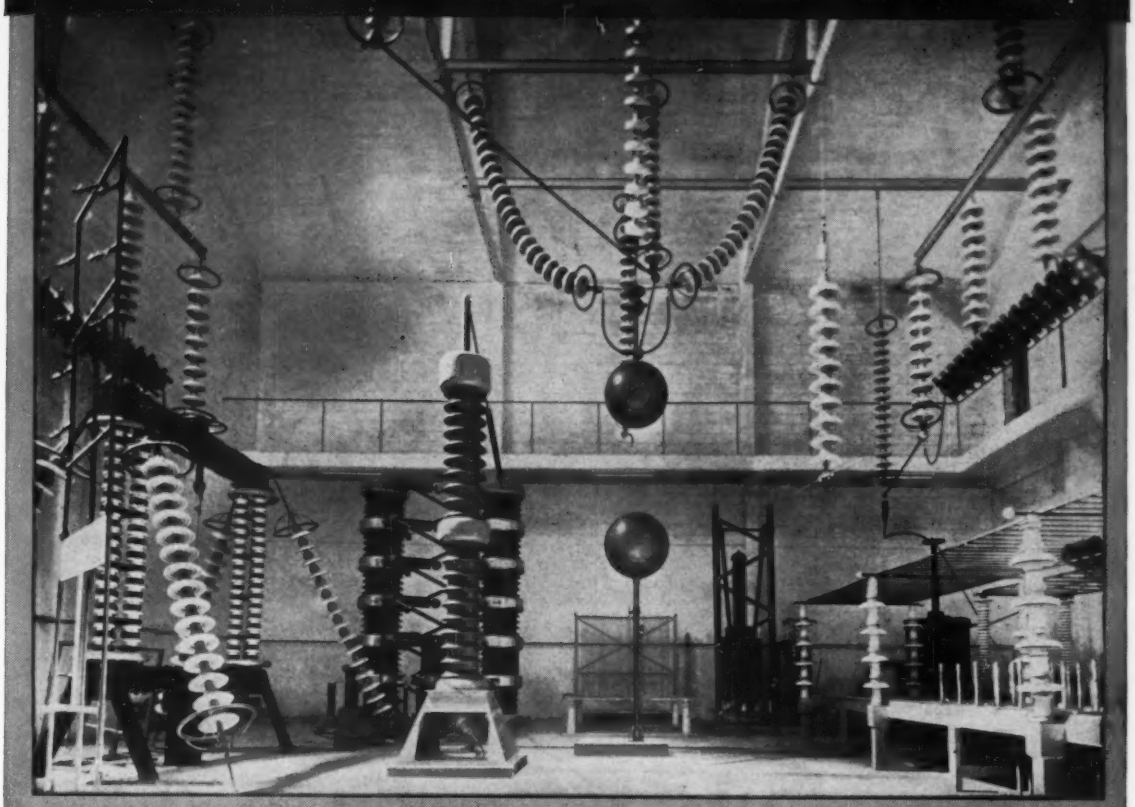
Ribbon Element Fuse

Consisting of silver elements surrounded by dry inorganic quartz sand, a current limiting fuse for motor

(*Continued on page* 144)

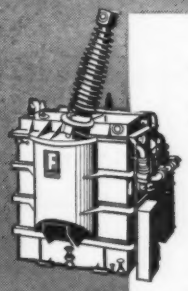
FERRANTI

HIGH VOLTAGE TESTING EQUIPMENT



ARGENTINA

A 1,000,000 volt Ferranti Impulse Generator installed in the Laboratories of Fabrica de Porcelana Armanino, Buenos Aires, Argentina.
This equipment produced the first ever 1,000,000 volt arc in Argentina. Ferranti have also supplied to the same customer a 500,000 volt, 250 kVA, A.C. Testing Equipment.



TRANSFORMER CAPACITY OF OVER 5,000,000 kVA per annum

The Ferranti transformer plant at Hollinwood, Lancashire, England, covering an area of over 300,000 sq. ft. has a manufacturing capacity per annum of over 5,000,000 kVA of Large Power Transformers, Distribution Transformers, Voltage Regulators, High Voltage A.C., D.C., and Impulse Testing Plant and Specialised Equipment. Contracts include the supply of transformers for the Garrison Dam and McNary Dam Projects in the U.S.A. and the Alcan Project in Canada.

F FERRANTI

FERRANTI LTD

Head Office and Plant : HOLLINWOOD, LANCASHIRE, ENGLAND

OFFICES AND PLANTS

NEW YORK : Ferranti Electric Inc., 30 Rockefeller Plaza, New York 20, N.Y.
TORONTO : Ferranti Electric Ltd., Mount Dennis, Toronto 15, Ontario.
MANCHESTER, ENGLAND : Ferranti Ltd., Moston, Manchester, 10.
EDINBURGH, SCOTLAND : Ferranti Ltd., Ferry Road, Edinburgh 5.

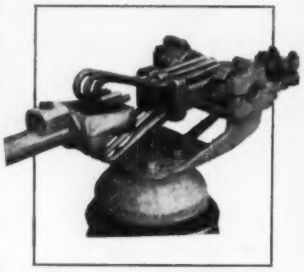
"After all, is there really much difference in switches?"

There certainly IS! Here's why

When you install a switch, it *must* be built to last—for years. Quality of materials and simplicity of operation are the keys to long life—and they're found in *every* Royal switch. For example, the VVL vertical break shown here has only 10 separate parts above the insulators in the final assembly of each pole — fewer moving parts for rugged, reliable operation.

The Royal VVL switch was the *first* to eliminate the use of braid shunts on the hinge contact, further simplifying operation. Permanently sealed aircraft type lifetime bearings eliminate maintenance. Future ground switch installation on all Royal switches is accomplished without completely dismantling the main switch.

EVERY ROYAL SWITCH EXCEEDS MINIMUM STANDARDS IN *EVERY* RESPECT. Make a date to see a Royal switch "in person"—Write today.



High pressure contacts

Over **50 lbs.** of pressure on each Beryllium copper contact rod mean high pressure wiping contacts, minimum resistance, and positive electrical connections.

ROYAL

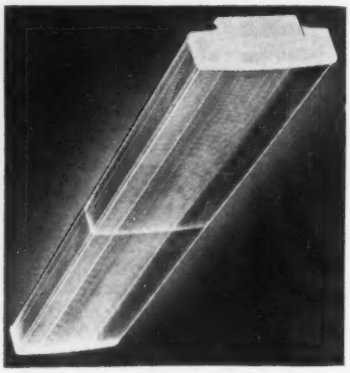
part of the arsenal of AMERICAN POWER PRODUCTION

ROYAL ELECTRIC MANUFACTURING CO., INC.
1122 EAST 87TH STREET • CHICAGO 19, ILLINOIS
Designers and Manufacturers of Power Switching Equipment and Special Electrical Devices

Ribbon Element Fuse

(*Continued from page* 142)

starter application provides a high continuous rating, manufacturer claims. It is enclosed in an insulating tube and connected to the circuit by means of copper ferrules on each end of tube. The device fits mountings of a predecessor wire element fuse.
General Electric Co, Schenectady 5, N. Y.



Commercial Fixture

Designed for industrial areas with critical seeing tasks, schools, offices and stores, this surface-mounted fixture features prismatic controlled light. Hinged 4-ft enclosure has two injection molded prismatic elements. Called Holiday, the fixture is available in 4 and 8-ft units with ends, and 8-ft fill-in section with coupling.
Day-Brite Lighting, Inc, 5411 Bulwer Ave, St. Louis, Mo.

Torque Control Tool

A power tool reportedly runs down fastenings to a pre-set torque, then automatically shuts off when the torque is reached. Called Impactool 5UT, the device has ½-in. square drive, ⅝-in. multipurpose bolt capacity and torque range from 20 to 90 ft-lb. Its over-all length is 10¼ in., weighs 6½ lb and is said to have free speed (forward or reverse) of about 1,900 rpm. Operation is on 110 or 220 v ac-dc.
Ingersoll-Rand, 11 Broadway, New York 4, N. Y.

(*More New Equipment on page* 148)

Walter H. Sterling,
Director of Purchases & Stores

Raymond S. Hill,
Purchasing Agent

Here, Reynolds Sales Engineer, J. C. Huckins, discusses conductor requirements in a typical purchasing meeting at Arizona Public Service.

A. W. Holt,
Buyer

Wm. J. Mullen,
Buyer

"Tested through the years---

Reynolds Renders Excellent Service"

***says* WALTER H. STERLING,**
Manager—Purchases and Stores
Arizona Public Service

"We have been buying Reynolds Aluminum wire for a number of years and are happy to be associated with a concern which has rendered such excellent service," says Mr. Sterling.

Other prominent electric utility men throughout the country also speak highly of Reynolds service . . . and Reynolds Aluminum electrical products. Whether they need ACSR, Covered Conductor (single, duplex, triplex or quadruple), RABC (Reynolds Aluminum Bus Conductor) or other aluminum products . . . they recognize Reynolds as a dependable source of supply—both service-wise and product-wise.

You, too, can rely on Reynolds for service . . . and assistance with your electrical problems. From in-the-office to in-the-field help . . . from product development to production . . . Reynolds offers a wealth of experience to complement your own knowledge in the electrical field. Reynolds Engineers will gladly meet with your staff and present complete information on all phases of electrical applications for aluminum.

And remember—there are also 33 Reynolds Electrical Distributors ready to serve you. Write for the name of the one nearest you. *Reynolds Metals Company, P.O. Box 1800-EL, Louisville 1, Ky.*

See "Frontier", Reynolds exciting dramatic series, Sundays, NBC-TV

The Finest Products Made with Aluminum are made with REYNOLDS ALUMINUM

new!

Sleet Hood, protective cover for silver plated phosphor bronze contact spring and guide plate. Closure and contact are simple and positive. Unaffected by weather. Hubbard design of guide plate and contact spring assures perfect closure action.

Complete terminal protection is provided by flexible snap-on bird guard through which a "lift" ring projects. Line attachment is by means of transformer type connector. Conductor may be snubbed through "lift" ring opening if desired.

New style, extra strong, insulated mounting bracket. Coating provides bird and animal protection.

Specially designed small bore fuse tube for high pressure instantaneous single vent expulsion. Fibreglass reinforcement provides mechanical strength to handle maximum current interruption, with no increase in bore diameter—and no destructive results.

Load break fitting attachment holes—Load break fittings provide means for mechanically disrupting connection. Furnished extra.

Locked recoil absorber bracket is provided to cushion recoil of discharge action. This prevents damage to the porcelain and mechanical assembly under stress of maximum current interruptions.

Cam locking device which permits unobstructed removal of fuse holder when in the open position, in addition to locking holder against accidental removal the instant closure is begun. Spring actuated leverage arrangement puts tension on fuse link to aid in quick opening.

Hubbard Distribution Fuse Cutout!

Exclusive small-bore fibreglass reinforced fuse tube design increases operating ranges

Now from Hubbard a new heavy-duty fuse cutout that opens a new era in the protection of equipment on your distribution lines. Incorporating new electrical and mechanical designs, the new Hubbard Cutout offers tremendous operational flexibility with its ability to clear faults over the entire operating range from minimum to maximum available fault current. No longer will it be necessary to continually check available fault current values at many different points as your system is expanded. What's more, the need for shifting cutouts to handle changing fault current values will be drastically reduced.

Heart of the new design is the small bore fibreglass reinforced, single vented fuse tube. By using a minimum inner diameter fuse tube and reinforcing it with fibreglass for maximum mechanical strength, Hubbard engineers were able to provide the positive expulsion action necessary for safe, sure, instantaneous arc interruption.

To support this greatly increased bursting action, entirely new high strength mechanical components were provided. There are no unnecessary or complicated parts in this new rugged simple design. Gas expulsion and fuse blowing are substantially completed before any parting of current carrying contacts. The entire current carrying circuit is composed of silver plated contacts of the pressure type. All springs are designed to act well below their elastic limits for maximum pressure maintenance throughout the life of the cutout. Positive closing is assured through the cam arrangement of the hinge mechanism which causes the fuse tube hinge to tighten as the fuse approaches the latched position.

Equipped with sleet, bird proofing and dead-end eye to meet local service conditions. Mechanical load break attachment can be specified as needed. Your Hubbard distributor will be glad to supply you with production samples. Call him today, or write for a copy of Bulletin 756.

HUBBARD AND COMPANY

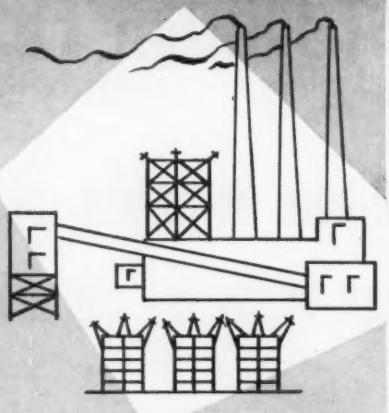
Pittsburgh 1, Pa.
Chicago 50, Ill.
Oakland 8, Calif.
Dallas (Plano), Texas

experience counts IN

TURBINE REPAIRS
- Reblading—Silver Soldering
- Balancing Rotors
- Relining Casings
- Rebabbitting Bearings

VALVE REPAIR & REBUILDING
PUMP REPAIRS

There's "know how" in Tickle's years of experience in the repair and maintenance of Power Station equipment! This experience, coupled with over 200,000 square feet of complete facilities, assures you of precision performance!



Estimates furnished from field surveys or from drawings and specifications.

ARTHUR TICKLE ENGINEERING WORKS, INC.
22-A Delevan St., Brooklyn 31, N. Y. • MAin 5-4200

Linemen call this hoist a "HONEY"

Designed especially for line work

Here's a strong, fast-operating, light-weight hoist (12 pounds) with a flexible steel load chain that won't kink, bind or uncouple. Controls can be worked without removing gloves. It's rated to lift a one-ton load and it's tested to 3000 pounds.

THIS CHANCE HOIST HAS ALL THE FEATURES LINEMEN WANT

- Well-balanced, easy-to-grip handle. . . operates from either side
- "Free-wheeling" for ease in hooking to load . . . automatic locking control prevents accidental dropping of load
- Half link and full link take-up for accuracy and speed
- Easy working swivel hooks on both chain and hoist housing
- Permanently lubricated oil-ite bearings
- All working parts fully enclosed in the housing to prevent injury to fingers.

ONE TON CAPACITY

A·B·CHANCE CO·
CENTRALIA, MISSOURI • SAN FRANCISCO, CALIFORNIA

ABC INDUSTRIES

CT55-2

Generator Governor

Electric governor for engine-generator sets anticipates speed change by constant load sensing while regulating on the generator frequency, manufacturer reports. Electrical circuitry in combination with hydraulic system reportedly initiates throttle change in about 0.015 sec after change in electrical load. Designed for 50/60 cycle or 400 cycle applications, the units measure 20 x 12 x 6 in.

Westinghouse Electric Corp, Box 2025, Buffalo 5, N. Y.

Dielectric Ovens

Suitable for heating, baking, drying and curing non-metallic materials, line of dielectric ovens is offered in 15 through 150-kw ratings. Features include rapid, uniform heating with precision control; uniform product quality; and space saving design, manufacturer claims. Bulletin 56-E available on request.

Young Bros Co, Dept 31, 1831 Columbus Road, Cleveland 13, Ohio.

Capacitor Vacuum Switch

Method of switching single-bank capacitor equipment with a vacuum switch has been developed by manufacturer. Except for a vacuum interrupting chamber, switch is similar to a conventional 3-pole, group-operated air-break switch. It provides switching service only, not fault interruption, manufacturer reports.

Vacuum switch is available with single-bank, grounded capacitor installations between 7.5 and 115 kv, and with ungrounded banks between 7.5 and 69 kv. Rated 600 amp continuous current with 4-sec symmetrical rating of 25,000 amp, switch has momentary current asymmetrical rating of 40,000 amp.

General Electric Co, Schenectady 5, N. Y.

MORE NEW PRODUCTS

Harnischfeger Corp, Milwaukee 46, Wis., offers stepless ac **control** for overhead electric traveling cranes. Control's electronic principle, using gas-filled tubes in control circuit, is said to reduce maintenance, stabilize hoisting and lowering speeds, and provide varied speeds on all motions.

Furnas Electric Co, Batavia, Ill., has a rotating **limit switch** with pilot ratings to 480 v. It incorporates two single-pole, double-throw snap action assemblies. Bulletin 5605 available on request.

Hoffman Engineering Corp, Anoka, Minn., offers oil-tight **raceway** in sizes 2½x2½ and 4x4-in. square in lengths up to 10 ft. Line of fittings permits bolting raceway together for most machinery, buildings.

Radiant Lamp Corp, 300 Jelliff Ave, Newark 8, N. J., has two types of R60 mercury **lamps.** Both have hard glass envelopes with silver reflectors for indoor or outdoor use without enclosed fixtures. Bulletin available on request.

Permacel Tape Corp, New Brunswick, N. J., offers rayon reinforced **film tape** with insulation resistance at 95% relative humidity of 1,000 Megohms and dielectric strength of 6,000 v.

Allied Precision Industries, Inc, Geneva, Ill., has a wall-mount **heater** 51¾x12¾ in. Designated Radiant glass model 2,000, it operates on 1 kw, 240 v. BTU output is 3,412.

Elliott Co, Jeannette, Pa., offers line of right-angle, single-worm reduction **gearmotors** in ½ to 30 hp ratings for ac-dc. Bulletin PB 18000-2 offered.

Cramer Controls Corp, Centerbrook, Conn., has series of automatic resetting **interval timers** in 15-sec to 24-hr range.

Minneapolis-Honeywell Regulator Co, Freeport, Ill., offers sealed, roller plunger, high-capacity **switch** handling inrush currents up to 75 amp.

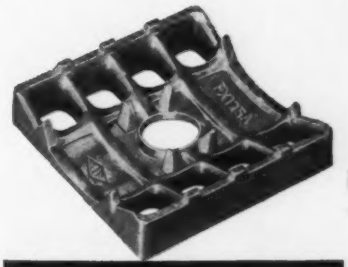
Airmatic Valves, Inc, 7313 Associate Ave, Cleveland, Ohio, has 2, 3 and 4-way **time delay valves** from 0 to 5 min.

M|F

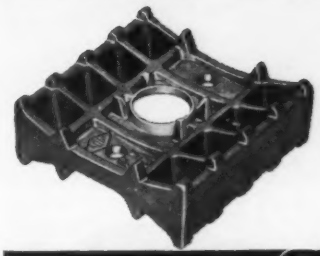
malleable iron

HIGH CORROSION RESISTANT

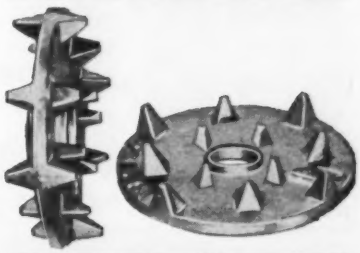
GRID GAINS and TIMBER CONNECTORS



GRID GAIN



DOUBLE GRID GAIN



TIMBER CONNECTORS

Improve stability and increase ultimate load by providing maximum contact for round wood member connections. M.I.F. Grid Gains and Timber Connectors require no special tools for installation.

- **Increase bearing value of the thru-bolt and shear value of the connection.**
- **Minimize bolt slotting.**
- **End need for pole framing.**
- **Reduce replacement requirements.**
- **Reduce possibility of decay by eliminating wood to wood contact.**
- **Offer many new opportunities to designers in the framing of both complex and simple structures.**

Write for Bulletin PH 10

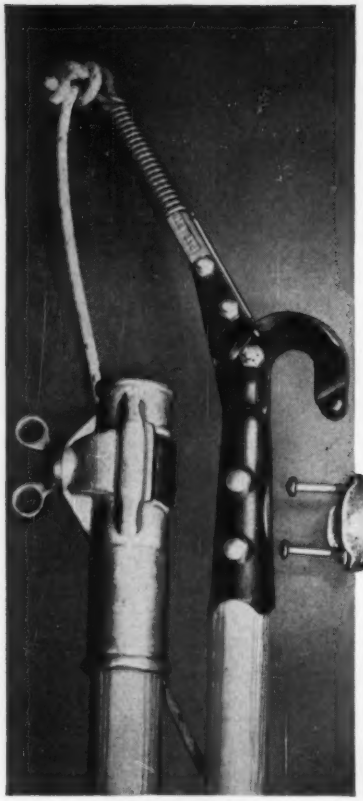
MALLEABLE IRON FITTINGS COMPANY

POLE HARDWARE DIVISION

Branford, Connecticut

M|F

Representatives: William J. Cottrell Co., Portland, Ore. • James H. Drew Corp., Indianapolis, Ind. • Industrial Engr. & Equip. Corp., Los Angeles, Cal. • JSG Electric Co., Chicago, Ill. • Lee-Smith Co., Miami, Fla. • B. H. McCoin, Knoxville, Tenn. • William J. O'Brien, Memphis, Tenn. • Robert P. Smith & Co., Jacksonville, Fla. • E. A. Thornwell, Inc., Atlanta, Ga. • J. P. Voight, Summerville, S. C. • Waltham, DeWitt & Krusi, San Francisco, Cal. • L. G. Wendegatz, Kansas City, Mo. • Williamson Sales Co., Shreveport and New Orleans, La.; Dallas, Houston, Tex.; Pine Bluff, Ark. • O. C. Witte Co., Detroit, Mich. **In Canada:** Line & Cable Accessories, Ltd., Toronto.



New DIECK Lightweight Tree Trimmer

Low cost, high quality

No. 3021-6, Trimmer 1.25" x 5'—$9.75

No. 3036 Extension, 1.5" x 6'—$9.75

Light head handles easy in long lengths. Max. capacity 1" cut.

Adapter for attaching pruning saw available.

All steel heat treated head, cuts easily, holds cutting edge.

Special double steel hook practically eliminates bending, breaking and twisting.

Spring can't catch or interfere when cutting.

Heavy Duty Pruners also available.
Write for further information on our full line of tree trimmers.

DIECK TOOLS

BODENDIECK TOOL CO.
TAYLORVILLE, ILLINOIS

PLM Type AC 600-v Terminator for armored cable

happy ending
FOR ARMORED CABLE RUNS

TERMINATORS from PLM

Type ACS Terminator for installations to 15 kv

Type BAC Bracket for wall or ceiling mounting

● Planning is easy...installation easier...with armored cable fittings from PLM! PLM Terminators are made for installations to 15 kv...in cast aluminum or bronze...eliminate need for bulky, costly potheads in many applications. PLM Unit Package Kits speed up the job, too...insure correctly designed terminations and splices at every point.

Put PLM in your plans for quick action on both standard and special needs. Write for catalog.

PLM *Products, Inc.*
3873 West 150th St. • Cleveland 11, Ohio

WIRE AND CABLE FITTINGS AND ACCESSORIES
Armored Cable Terminators • Splicing and Terminating Kits • Conduit Ventilators

CATALOGS—BULLETINS

● **TRANSFER SWITCHES:** Features, capabilities and factors affecting automatic transfer switch selection are described in 16-page Bulletin 596. Automatic Switch Co, 391 Lakeside Ave, Orange, N. J.

● **¼-TURN FASTENERS:** Three types of quarter-turn fasteners, their applications, specifications, installation and strength characteristics, are described in 12-page catalog. Southco Div, South Chester Corp, 200 Industrial Highway, Lester, Pa.

● **DC POWER SUPPLIES:** Bulletin CV-235, 8 pages, describes constant voltage dc power supplies for intermittent, variable, pulse or high amperage loads. Sola Electric Co, 4633 W. 16th St, Chicago 50, Ill.

● **CONVEYORS:** Size and dimension data, typical installations are subject of 24-page catalog on line of 19 power conveyors. Harry J. Ferguson Co, Jenkintown, Pa.

● **UNIT HEATERS:** Bulletin 700A, 36 pages, includes specifications and performance data on line of vertical and horizontal unit heaters. American Air Filter Co, Inc, 215 Central Ave, Louisville, Ky.

● **WELDER CONTROL:** Bulletin 338, 6 pages, describes predetermined, electronic welder control which counts cycles of power line frequency to control welder sequence. Sciaky Bros, Inc, 4915 W. 67th St, Chicago 38, Ill.

● **LIGHT PANELS:** New prismatic-fluted glass for fluorescent fixture lighting panels are detailed in Bulletin L-110-C, 6 pages. Corning Glass Works, Corning, N. Y.

● **WELDING:** Resistance welding products, accessories and materials are described in Catalog 56, 56 pages. Weldaloy Products Co, 11551 Stephens, Van Dyke, Mich.

● **CONTROL VALVES:** Details and functions of two-way (Bulletin 80200), and three and four-way (80300) directional control valves are described in two 16-page bulletins. Oilgear Co, 1594D W. Pierce St, Milwaukee 4, Wis.

● **CABLE:** Two booklets discuss data on interlocked armor (19-555, 20 pages) and aerial (19-266, 16 pages) cable. General Electric Co, Construction Materials Div, Bridgeport 2, Conn.

● **TUBING:** Folder TB-413, 6 pages, contains extrusion process, sizes and shapes of tubular and solid extruded products. Folder TDC-184, 4 pages, includes technical data on 12 widely used "4100 series" of alloy steels. Babcock & Wilcox Co, Tubular Products Div, Beaver Falls, Pa.

● **OIL PURIFICATION:** Features, capacities and typical installations of heavy fuel oil purifiers are given in 4-page Bulletin HF-102. De Laval Separator Co, Poughkeepsie, N. Y.

● **FLUOROCARBONS:** Forms, properties and uses of fluorocarbon products—from plastic resins to acids and dielectric fluids

1½ kva too small?

G-E Service Shop

uprates to 5 kva!

There's lots of life in your old distribution transformers yet! Just let your local G-E Service Shop replace the old cores and coils with new factory-built units of higher kva capacity. Your transformers are returned good as new. There are 31 G-E Service Shops throughout the country—one near you. 431-33

Progress Is Our Most Important Product

GENERAL ELECTRIC

—are described in an 8-page brochure. M. W. Kellogg Co, Box 469, Jersey City 3, N. J.

● **POLYETHYLENE:** File folder of Polyethylene Processing Tips includes properties, types and operating conditions of resins. U. S. Industrial Chemicals Co, 99 Park Ave, New York 16, N. Y.

● **WARNING SIGNAL:** Bulletin 632, 2 pages, discusses features and data of flashing visual warning signal. Pyle-National Co, 1334 N. Kostner Ave, Chicago 51, Ill.

● **TUBING:** Engineering data on cylinder and hydraulic fluid line tubing are given in Bulletin 12-6, 8 pages. Joseph T. Ryerson & Son, Inc, Box 8000-A, Chicago 80.

● **HEATING:** Four-page catalog on radiant heating panel line includes specifications and installation facts. Heatmore, Inc, 59 Throop Ave, Brooklyn 6, N. Y.

● **CIRCUIT BREAKERS:** Line of general purpose circuit breaker is described in Bulletin 3411, 20 pages. Heinemann Electric Co, Trenton 2, N. J.

● **BATTERIES:** Control and standby batteries for switchgear, power and emergency lighting are given in Bulletin 334, 4 pages. Bulletin 168, 4 pages describes engine starting, standby and remote power applications. Nickel Cadmium Battery Corp, 70 Pleasant St, Easthampton, Mass.

● **SHOCK, VIBRATION:** Bulletin SVC-55, 4 pages, describes theories, types and controls of vibration isolation and shock absorption. T. R. Finn & Co. Inc., 200 Central Ave, Hawthorne, N. J.

● **ISOTOPES:** Revised Stable Isotopes Catalog provides inventory and price list. Details of sales and loan policy are included. Union Carbide Nuclear Co, Oak Ridge National Laboratory, Oak Ridge, Tenn.

● **ALUMINIZED WIRE:** Six-page Bulletin DH-537 gives physical characteristics and applications of aluminized wire and wire products. American Chain & Cable, Monessen, Pa.

● **GEARMOTORS:** Line of gearmotors in ratings from ⅛ to 30 hp are discussed in 16-page Bulletin 1880. U. S. Electrical Motors, Inc, Box 2058, Los Angeles 54.

● **OVERHEAD CRANES:** Bulletin U-200-1, 16 pages, describes line of underhung overhead cranes up to 12-ton capacity. Chicago Tramrail Corp, 1330 S. Kostner Ave, Chicago 23, Ill.

● **CLUTCH:** Electrically controlled clutch that connects or disconnects driven shaft or gear from driving shaft while shaft is running or standing still is described in Bulletin 5306, 4 pages. I-T-E Circuit Breaker Co, Transformer & Rectifier Div, 19th & Hamilton Sts, Phila. 30, Pa.

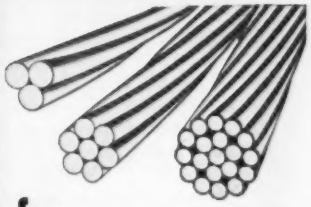
● **COPPER ALLOY:** Four-page Bulletin "'Berylco' 10 Strip" includes applications and physical properties of copper alloy in strip form. Beryllium Corp, Reading, Pa.

● **ALUMINUM DIGEST:** Monthly 32 to 36-page digest of trade magazine articles on recent aluminum developments covers production and fabricating methods, properties, standards, new products and markets. Reynolds Metals Co, Desk ES, 2500 S. 3rd St, Louisville 1, Ky.

(*More Catalogs on page* 152)

ACCO Quality

PAGE Stainless Steel Strand



for Severe Service Conditions

PAGE Stainless Steel Strand is equally versatile for ground, guy and catenary applications. Its higher tensile strength, corrosion-and-abrasion resistance, elastic limit and strength-to-weight ratio make it your first choice! Its lower cost per year of use means long-range economy.

Write us at Monessen, Pa., for complete information

ACCO

Monessen, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Bridgeport, Conn.

PAGE STEEL AND WIRE DIVISION
AMERICAN CHAIN & CABLE

for Better Value

PAGE chain link FENCE

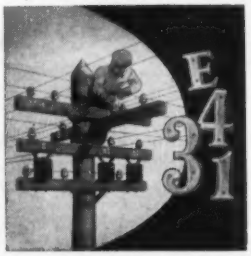
America's First Wire Fence—since 1883

• When next you need fence as protection against common hazards you certainly will want time-tested quality in the safeguard you provide. Whether you choose heavily galvanized Copper-Bearing Steel, corrosion-resisting Aluminum, or long-lasting Stainless Steel, PAGE Fence is quality controlled from raw metal to rugged fence erected on metal posts deep-set in concrete. Available are 8 basic styles, varied by heights, types of gates, top rails, and barbed wire strands for added security. Finally, your PAGE Fence will be expertly erected by a reliable, technically trained firm. For important fence data and name of nearest PAGE firm—

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

Serving the Utilities that Serve the Nation



PREMAX POLE MARKERS

Linemen and plant crews identify trouble areas fast with easy-to-read Premax Markers. Designed for high legibility in weatherproof aluminum or brass, Premax letters, figures, tags and special marking devices are the choice of utilities across the nation.

R.E.A. Approved. Ask your jobber, or write

PREMAX PRODUCTS Div. Chisholm-Ryder Co. Inc. 5652 Highland Ave., Niagara Falls, N. Y.

F & H Self-Powered HOLE DIGGER

The modern way to dig holes. No expensive installation. Fits on any A frame. Equipped to dig holes 8' deep and up to 20" in diameter. One man operates digger as all controls are mounted on machine. Available in 8-HP and 14-HP models. Auger is cleaned by spinning. Digs anchor holes with ease. Write for full information. Film of machine in operation available on request.

Manufactured by
FOUSHEE & HECKENDORN
P. O. BOX 65,
CEDAR POINT, KANSAS

CATALOGS—BULLETINS

(*Continued from page* 151)

• **WIRING:** Line of wiring devices and installation equipment are described in 36-page Catalog 156. Keystone Mfg Co, 23328 Sherwood Road, Center Line, Mich.

• **REFRIGERATION:** Engineering data on hermetic centrifugal refrigerating machines in 90 to 350-ton capacities are given in Catalog 19C-100. Carrier Corp, Syracuse, N. Y.

• **MATERIAL TESTING:** Methods of nondestructive testing of materials and parts are discussed in Catalog "Seeing Isn't Always Believing." Magnaflux Corp, 7300 W. Lawrence Ave, Chicago 31, Ill.

• **STORAGE RACKS:** Catalog on storage rack line describes features, assembly and capacities; 32 pages. American Metal Products Co, 5959 Linsdale Ave, Detroit 4.

• **GLASS LAMINATES:** Four-page brochure "Silicone Glass Laminates" gives applications and typical properties. Dow Corning Corp, Midland, Mich.

• **FLOODLIGHT:** Bulletin GEA-6435, 12 pages, discusses athletic, commercial and industrial applications of a floodlight, designated L-69A. General Electric Co, Schenectady 5, N. Y.

• **PUMPS:** Class CRV cradle-mounted centrifugal pumps with 5 to 2,800-gpm capacities and pressures of 10 to 525 ft total head are described in Bulletin 7223-B, 20 pages. Ingersoll-Rand Co, 11 Broadway, New York 4, N. Y.

• **TEFLON:** Brochure T-110, 12 pages, describes Chemlon products fabricated from DuPont Teflon. Crane Packing Co, 6400 Oakton, Morton Grove, Ill.

• **GAS PRODUCERS:** Pricing data, features, dimensions and applications are given in Bulletin GEC-1375, 8 pages, on Neutralene gas producers which produce purified exothermic gas for protective atmosphere heat treating. General Electric Co, Schenectady 5, N. Y.

• **SWITCHES:** Specifications and features for automatic stepping switches (Bulletin T5001, 12 pages, and manually operated key switches (T5002, 24 pages, are given in two publications. Orginally used for telephone systems, the electromechanical switches are available for industrial applications. Stromberg-Carlson Co, Telephone Div, Rochester 3, N. Y.

• **TRENCHERS:** Line of trenchers and backfillers are discussed in Bulletin L-101, 4 pages. Cleveland Trencher Co, 20100 St. Clair Ave, Cleveland 17, Ohio.

• **PROCESS HEATING:** Catalog featuring radiation-convection system includes applications and information on heating and conveyor systems, 16 pages. Jensen Specialties, Inc, 9331 Freeland Ave, Detroit 28, Mich.

• **FASTENING:** Various applications of Ramset powder-actuated tool are diagrammed in booklet form. Ramset Fastening System, 12117 Berea Road, Cleveland.

• **PUMP MOTORS:** Bulletin GEA-6521, 6 pages, discusses design features and performance of vertical hollow shaft motors, 7½ through 30 hp. General Electric Co, Schenectady 5, N. Y.

CRIPPLED GUY GUARDS ARE DANGEROUS!

REPLACE THEM

NOW!

THE OVERTON

Flexibal

WAY

ECONOMICALLY — EASILY

1. Slip Over Wire
2. Drive Home Nail
3. Attach Clamp

IT'S AS SIMPLE AS THAT!

Costs ⅓ less than Metal Guards and No Maintenance Problem

ORDER NOW — IMMEDIATE DELIVERY

SEE YOUR JOBBER OR WRITE TO

S. E. OVERTON COMPANY

SOUTH HAVEN, MICHIGAN

1st

52

. . . of the reason why there's only one basic reference in the electric power field is in your hands right now. Over 25,000 men like yourself find Electrical World helps them do a better job. Make the most of it!

INDUSTRY FILMS

● **BLUE PRINT FOR POWER:** 16 mm, color and sound, motion picture, 22 min, no rental charge. Demonstrates advantages derived from use of rigid steel conduit and EMT in building and renovating programs. Rigid Steel Conduit and EMT Section, National Electrical Manufacturers Association, 155 E. 44th St, New York 17, N. Y.

● **THE TENANT AT 1010 MAIN:** 16 mm, color and sound, motion picture, 32 min, no rental charge or can be purchased. A building manager found that a higher voltage system would provide savings for a new system in an obsolescent building. General Electric Co, Apparatus Sales Division, One River Road, Schenectady 5, N. Y.

● **POLE INSPECTION AND MAINTENANCE:** 16 mm, color and sound, motion picture, no rental charge or can be purchased. Explores the importance of proper inspection of utility poles; a camera trip to the Southern Maryland Electric Cooperative. Area Director, REA, U. S. Department of Agriculture, Washington 25, D. C.

● **ZINC CONTROLS CORROSION:** 16 mm, color and sound, motion picture, 35 min, no rental charge. Explains how zinc in its role of "protector" controls corrosion. American Zinc Institute, 60 E. 42nd St, New York 17, N. Y.

● **CARMET—CEMENTED CARBIDES:** 16 mm, color and sound, motion picture, 27 min. Presents manufacturing process of Carmet carbides from powder to finished cutting and shaping tools; includes application. Allegheny Ludlum Steel Corp, Room 2020, Oliver Building, Pittsburgh 22, Pa.

● **A BRIGHTER TOMORROW:** 16 mm, color and sound, motion picture, 30 min, no rental charge. Deals primarily with electroplating facet of metal products finishing. Bart-Messing Corp, 229 Main St., Belleville, N. J.

● **MOLDING PHENOLICS:** 16 mm, black and white, sound, motion picture, 20 min, no rental charge. Instructors manual included. Brings together the steps in the production of phenolic molded articles. Bakelite Co, 260 Madison Ave, New York 16, N. Y.

STEEL

Every Kind

Quick Delivery

Plates, Structurals, Bars, Sheets, Tubes, etc. Carbon, Alloy, Stainless Steels, Babbitt Metal.

RYERSON

Plants at: New York • Philadelphia Boston • Wallingford, Conn. • Charlotte, N. C. • Cincinnati • Cleveland Detroit • Pittsburgh • Buffalo • Chicago Milwaukee • St. Louis • Los Angeles San Francisco • Spokane • Seattle

"VOLT-TELLING STATISCOPE" protects worker

. . . when held in any alternating electrical field. Indicates presence of voltage in AC and Pulsating DC Circuits and in various electrical apparatus. . . . Pocket-size illustrated above, also in Station and Overhead Extension types. Thousands in use. Order from Electrical Jobber. Send for new literature.

MINERALLAC ELECTRIC COMPANY

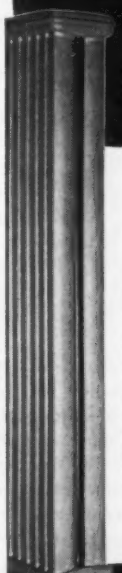
MANUFACTURERS OF STATISCOPES, HANGERS, CLIPS, STRAPS, INSULATING AND CABLE-PULLING COMPOUNDS

25 NORTH PEORIA STREET • CHICAGO 7, ILLINOIS

Specify

SHAW-PERKINS COOLING RADIATORS

. . . design standard for the transformer industry



Built by specialists, properly designed throughout to give *any make of transformer* full advantages of economical, dependable thermo-siphon principle of self-cooling. Valves, flanges, elbows, available. Transformer tanks built to customer's design.

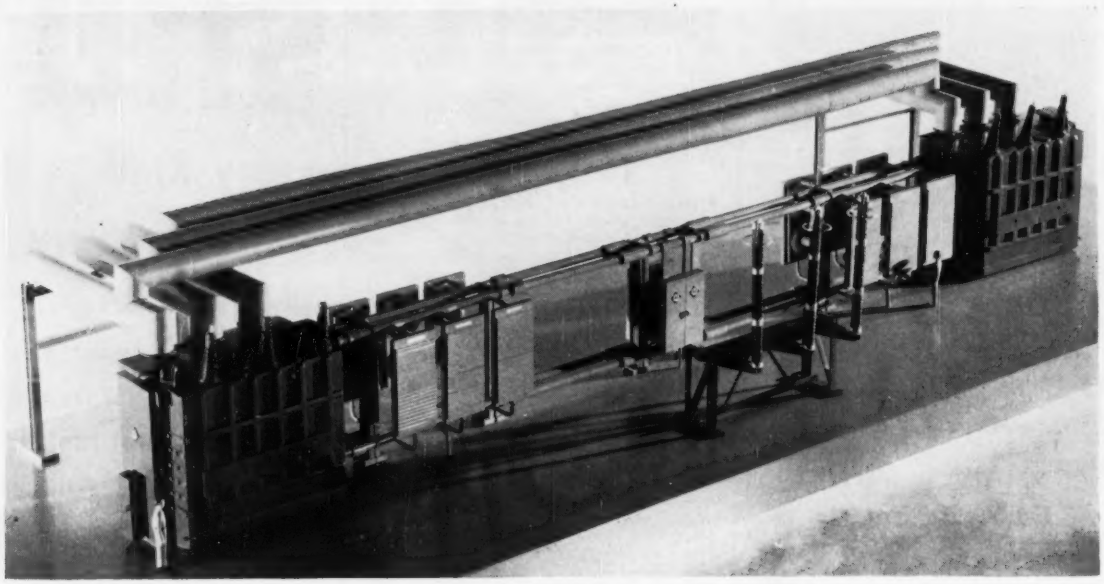
Write today for full information.

SP-15

MANUFACTURED BY

SHAW-PERKINS

201 EAST CARSON ST. • PITTSBURGH 19, PA.



Old Problem Gets New Allis-Chalmers Approach of . . .

Two Transformers . . . One Cooling System

A recently developed system of cooling large power transformers has been announced by Allis-Chalmers Manufacturing Co. With the new development, two or more large transformers are connected to a common forced-oil manifold cooling system. Thus, one transformer will carry a major portion of the load of two units indefinitely with no increase in temperature, the company says.

First installations of the system will be in generating stations using cross compound turbines. A dual-cooling job, rated 400,000 kva, is under construction for Philadelphia Electric Co's Eddystone Station. A similar order has been placed by Southern California Edison Co.

According to A-C, the transformer cooling system offers solution to two big problems faced by electric companies: **1.** Three-phase generating or transmission loads which require big, hard-to-ship transformers can be served with two or more units of smaller size; **2.** it eliminates the reliance on a single three-phase transformer to handle large blocks of power and "opens the door to 1-million kw generating units."

"Essentially," an A-C spokesman said, "the new cooling system provides single-phase reliability with three-phase economy."

With the system, transformers can be placed in practically any physical relationship to take advantage of economical bus or overhead connections, the announcement stated. Here's how the firm describes some of the system's operating and design features:

Main Features Described

One or more pairs of cooling manifolds inter-connect transformers. These manifolds, which may be mounted between or alongside transformers, have groups of forced oil/forced air heat exchangers. A-C calls their's Electro-Coolers, which are similar to types it now uses on large units. Normally-closed valves are located between the cooler banks in normal operation. Controls for valves and cooling fan motors can be automatic and interlocked with primary and secondary switching, where desired.

There is no limit, theoretically, to emergency increase in transformer capacity available from additional cooling, A-C said. So far, installations will have each transformer designed to carry 175% of full load continuously when both banks of Electro-Coolers are in service. Under 125%, fan operation will probably be unnecessary.

Although the system costs more than one large unit, Allis Chalmers says its price will compare favorably with two half-size units that lack the new system's features. The dual-cooling of identical transformers is expected to receive greatest interest, but "it will be entirely practical to use common cooling for three or more units, either single or three phase," the A-C spokesman said. Water cooling can also be used in place of forced air.

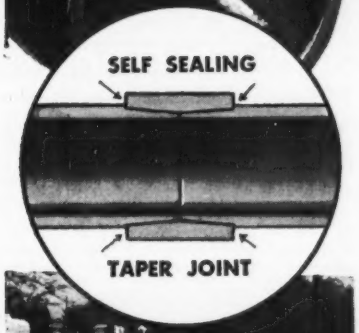
I-T-E Acquires Stock of Kelman Electric & Mfg

I-T-E Circuit Breaker Co's President W. M. Scott, Jr, announced recently that his Philadelphia, Pa., firm has acquired all the capital stock of Kelman Electric & Mfg Co through an exchange of I-T-E common stock with Kelman's founders and owners.

Harry L. Buck, I-T-E vice president

(*Continued on page* 156)

SMOOTH BORE!



Orangeburg Fibre Conduit Prolongs Cable Life

Protect cable sheath from abrasion and you prolong the life of underground cables, say utility engineers. Scoring of cable sheath creates "trouble spots" that shorten cable life.

That's where Orangeburg Fibre Conduit plays an important part in keeping cables healthy. Orangeburg's smooth bore, its low coefficient of friction minimize the danger of abrasion when cables are pulled in, as well as later on during cable movement. By protecting cable sheath from abrasion, Orangeburg Fibre Conduit adds years to cable life.

Orangeburg's impermeable wall and watertight joints protect cables from corrosive ground waters. Its nonmetallic material is strong, tough, resilient, long lasting.

And, remember, Orangeburg lays faster and at lower cost than other types of conduit. It is light in weight, easy to handle, easy to tool on the job. Spacers, bends, fittings, 5° bend sections and lightweight tapering tool, all combine to simplify installation.

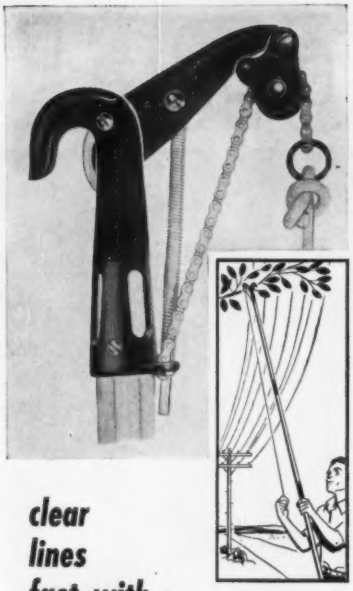
Since 1893, records of long life have proved Orangeburg's durability and economy.

Orangeburg Fibre Conduit is distributed by Graybar Electric Company and General Electric Supply Company with branches and stocks in principal cities.

WRITE DEPT. EW-86 FOR NEW CATALOG 52.

ORANGEBURG MANUFACTURING CO., INC., Orangeburg, N. Y. West Coast Plant, Newark, Calif.

ORANGEBURG®
FIBRE CONDUIT



clear
lines
fast with...

SEYMOUR SMITH
"Telephone" Tree Pruner

Here's the standard, the choice of the utility industry for years. Powerful action to cut cleanly—tough and almost unbreakable—easy to handle. No. 12 Pruner Head has 1½" cutting capacity. The lighter, No. 11, handles up to 1" branches. Both are malleable iron castings with tempered steel cutting blade.

Poles (18 ft. 3 sections) are of selected spruce with positive locking, seamless aluminum, telescoping ferrule joints.

FAST CUTTING PRUNING SAWS

Designed for fast, easy cutting—large, deep teeth, finest Swedish charcoal steel, streamlined, laminated hardwood handles. Every model you need up to chain saw work.

No. 20 POLE SAW HEAD

Tough aluminum head with large hook and outside horn for pushing branches, raising wires, etc. Also paint brush holder with wire clamp that holds brush securely. Fast-cutting 16" blade. Poles available.

FREE: Send for Seymour Smith catalog pages on tools for utilities. Keep them on file for easy reference.

Quality Tools
SEYMOUR SMITH
Since 1850

SEYMOUR SMITH & SON, Inc.
2408 Main St., Oakville, Conn.

I-T-E Acquires Kelman

(*Continued from page* 154)

and general manager, has been named president of the newly-acquired company.

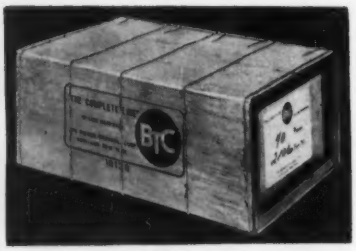
Located in Los Angeles, Calif., the 48-yr-old Kelman firm makes high-voltage circuit breakers rated from 7.2 to 220 kv with interrupting ratings to 10 million kva. These products complement those of I-T-E. Kelman will continue manufacturing and marketing these products as an I-T-E subsidiary, Scott said.

H. K. Porter Co Purchases Electric Service Mfg Co

H. K. Porter Co purchased Electric Service Mfg Co, Philadelphia, Pa., late last month for an amount estimated by one observer as "several millions." Electric Service manufactures electrical equipment for utility and transportation industries, and heavy industrial plants.

The acquisition's sales and research activities will be combined with another Porter division, Delta-Star Electric of Chicago. This will help reduce selling costs and further the development of new Electric Service products, according to Porter President T. M. Evans. Management of the Philadelphia company will continue with the new Porter unit.

Porter's continued expansion in the electrical equipment field has been indicated by reports that the company is considering the purchase of another manufacturer's electrical division located on the eastern seaboard.



BTC Uses New Package for 'Hi-Line' Hardware

Wire-bound wood boxes have been adopted by Brewer-Titchener Corp, Cortland, N. Y., for its line of BTC drop-forged Hi-Line hardware. Light enough for one man to handle, the boxes require little warehouse or truck space, the company says.

Advantages claimed for storage features are easy stacking and fast identification by quantity and catalog label. Formerly bags were used.

Solar Furnace Planned For Central Arizona

A $250,000 solar furnace and solar laboratory somewhere in Central Arizona will be a reality within a year, according to John Yellot, secretary of the Association for Applied Solar Energy at Phoenix, Ariz.

The furnace will be 30 to 50 ft diam. Funds for the project have been pledged by about 20 Arizona individuals and firms. It will be built along designs discussed by Dr Felix Tromble at the recent World Symposium on Solar Energy in Phoenix. He has directed France's solar laboratory.

MANUFACTURERS' EARNINGS

COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1956	NET INCOME 1955	EARNINGS PER COMMON SHARE 1956	EARNINGS PER COMMON SHARE 1955
Allis-Chalmers Mfg Co.....	6	June 30	$11,855,735	$12,562,932	$1.44(a)	$1.54(a)
Buffalo Forge Co.....	Quar	May 31	402,939	301,852	0.62	0.46
Fairbanks, Morse & Co....	6	June 30	1,310,557	1,303,419	0.96(a)	1.06(a)
General Electric Co.....	6	June 30	112,864,000	107,799,000	1.30	1.24
Gould-National Batteries..	12	Apr 30	2,953,740	2,571,574	3.77	3.27
Koppers.....	6	June 30	6,930,522	4,871,851	2.89	2.29
Minneapolis Honeywell....	6	June 30	9,560,314(p)	7,240,898(q)	1.46	1.13
Orangeburg Mfg Co.....	24 Wk	June 17	485,726	377,152	1.14	1.08(g)
Sylvania Elec Prod.....	6	June 30	7,323,515	6,088,019	2.16(a)	1.90(a)

(a) Based on shares outstanding at close of respective periods. (f) Net loss. (g) Adjusted for two-for-one stock split in Nov. 1955. (p) Includes operations of all wholly-owned subsidiaries. (q) Includes company's Canadian subsidiary only.

Here are answers to your everyday questions on

ELECTRIC UTILITY

- rate fixing
- rate modification
- rate comparisons

Here is a comprehensive, practical treatment of the problems of establishing utility rates, covering everything from the economic nature of the utility to the fine points of actual rate making. *The effects of profit objectives, customer service and satisfaction, and technical and regulatory influences are emphasized throughout,* in an authoritative and clearly written guidebook.

Just Published

Electric Utility RateEconomics

By RUSSELL E. CAYWOOD

Manager of Rates, West Penn Power Co.

235 pages, 60 charts, tables, diagrams. $10.00

HERE is a book for the power salesman, the utility lawyer, the experienced rate man, and others, bringing them the complete story of electric utility economics, from technology to metering. Its fifteen chapters cover the *background* of the industry; *technical factors* influencing price structure; the *mechanics* of rate making; *short-cut methods* for estimating effects on revenue of price changes; *pointers* on developing a rate modification program; rate case *decisions* to help you understand today's regulatory thinking; *ways and means* of determining the economic relationships of several engineering problems; the *how and why* of metering, metering economics, and load control. Here is comprehensive information for all concerned with the place of rates in utility economics and with sound methods of rate making.

Includes a number of diagrams and tables to give you clear-cut visualization of

Revenue dollar disposition—Trends of prices and and electric rates—Service charge vs. the minimum charge—Instantaneous peak provisions—Variation of cost with metering voltage and load size—Thermal meter characteristics—Depreciation accrual patterns—Break-even point—and other factors

MAIL THIS COUPON

10 DAYS' FREE EXAMINATION

McGraw-Hill Book Co., Inc., Dept. W-8-6
327 W. 41st St., New York 36, N. Y.

Send me Caywood's **Electric Utility Rate Economics** for 10 days' examination on approval. In 10 days I will send $10.00, plus few cents for delivery costs, or return book postpaid. (We pay delivery cost if you remit with coupon; same return privilege.)

(PRINT)
Name .....
Address .....
City ..... Zone .... State .....
Company .....
Position .....

For price and terms outside U. S. write McGraw-Hill Int'l., N.Y.C. W-8-6

M&M BRIEFS

Westinghouse Electric Corp . . . Recent developments include these items:

- A low bid of $1,059,156 was submitted to the city purchasing agent at Seattle, Wash., to furnish 14 unit substations rated 5,000 kva and 26 kv for Seattle City Light. Four other bids ranged up to $1,101,080.
- Elevator Division — New orders booked during the second quarter of 1956 reached $22 million as against $14 million for that period in 1955, said W. O. Lippman, vice president. First half bookings for 1956 were $35 million up from $24 million for 1955, he reported.
- Elevator production facilities are currently expanding with addition of a new multi-million dollar plant at Dover, N. J. This plant will have about 250,000 sq ft of floor space devoted primarily to electric stairway production. It is scheduled to be in operation in 1957.
- Two 83,000 hp motors will furnish hurricane gales up to 3,800 miles per hour in a gigantic wind tunnel being built for the Air Force at Tullahoma, Tenn.

Siegler Corp of Chicago, Ill., and Pasadena, Calif., has located its headquarters offices in Chicago's Merchandise Mart. Robert L. Purcell, executive vice president, has a desk-side TV receiver which shows all company callers as seen by a camera located at the entrance to the company's suite. The closed circuit TV installation is manufactured by Siegler's Hallamore Division in Long Beach, Calif. Company's products are heating equipment, electronic devices, and power tools.

Cutler-Hammer, Inc, Milwaukee, Wis., has received stockholder approval of a proposed two-for-one split of the company's common stock. Shareholders approved changing common stock from no par value status to $10 per share. Increase of authorized shares from 750,000 to 2 million was also okayed.

Northern Electric Co of Ontario and Quebec may expand its operation in British Columbia to include a manufacturing plant. Col. R. D. Harkness, head of the firm, said the expansion plan was "only in the discussion stage."

LABORATORY CONTROLLED . . .

Crapo

GALVANIZED STEEL STRAND FOR GUY, MESSENGER and OVERHEAD GROUND WIRE

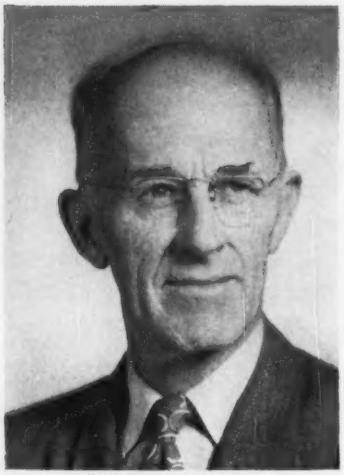
The high, uniform, consistently-dependable quality of Crapo Galvanized Steel Strand is the direct result of close laboratory control over each step in manufacture. All wires used in forming a particular size and grade are produced from steel of selected analysis, carefully processed under technical supervision and stranded on precision machines. Both wire and finished strand are subjected to prescribed laboratory tests to insure the desired end result.

Heavy, uniform, tightly-bonded zinc coatings, applied by the famous Crapo Galvanizing Process, provide maximum resistance to corrosion.

Write for booklet OG-25 containing "Sag and Tension Data for Overhead Ground Wire."

INDIANA

STEEL & WIRE CO., INC., Muncie, Indiana



ROBERT D. ELLIOTT

C. H. DAVIS

LESLIE BURFORD

3 VP's, Chief Engineer Appointed by Dallas P&L

The election of three new vice presidents—Robert D. Elliott, C. H. Davis, and Leslie Burford—has been announced by C. A. Tatum, Jr, president and general manager of the Dallas Power & Light Co. The Texas utility has also announced that E. W. Rogers has been appointed to the post of chief engineer.

Elliott, who formerly served as chief engineer of the company, has been elected vice president and consulting engineer, with engineering consulting responsibilities. He graduated from the Agricultural & Mechanical College of Texas in 1917 with a degree in electrical engineering. After service in World War I, he joined Dallas Power & Light in 1920 as a field engineer. Since that time Elliott has served in various capacities in the utility's engineering department. He was appointed to his most recent post of chief engineer in 1942.

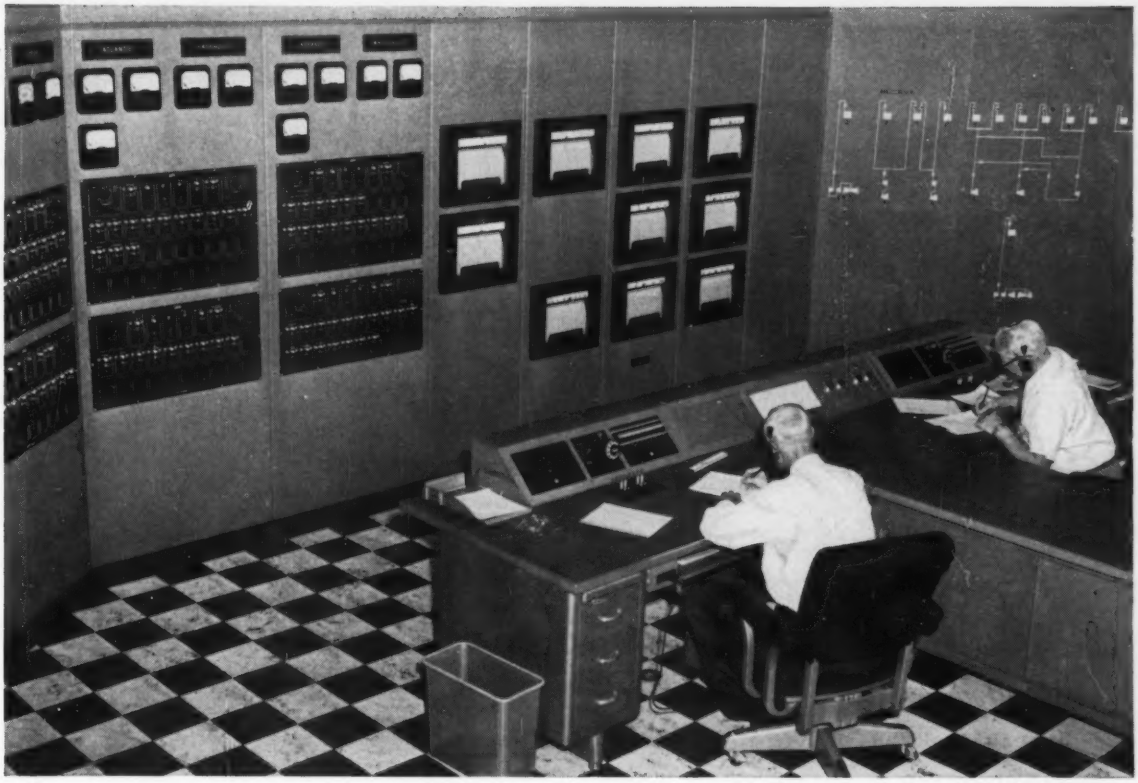
Davis, previously superintendent of power plants, has been elevated to the post of vice president in charge of production. He will assume responsibility for the operation of the company's plant department. The new vice president has been associated with Dallas Power & Light since his graduation in 1922 from Agricultural & Mechanical College of Texas, where he received his degree in electrical engineering. He has served continuously in the company's plant department and since 1933 he has been superintendent of power plants.

Burford, until recently head of the distribution department, has been designated vice president in charge of distribution for the company. In this post he will have responsibility for operation of DP&L's distribution department. Prior to joining the company he attended Austin College and the University of Texas, where he studied electrical engineering. Burford has had nearly 20 years of experience in the rate, commercial, and distribution departments of Dallas Power & Light, and for the past 13 years he has served as head of its distribution department.

Rogers, who now becomes new chief engineer, has been appointed to head the utility's engineering department. He also attended the Agricultural & Mechanical College of Texas, from which he graduated in 1922 with a degree in electrical engineering. While attending A&M he was employed one summer as a student engineer for Dallas Power & Light, and immediately after his graduation he rejoined the company on a full time basis. He has served in the utility's engineering department continuously since January, 1923, and has been assistant head of this department for the past nine years.

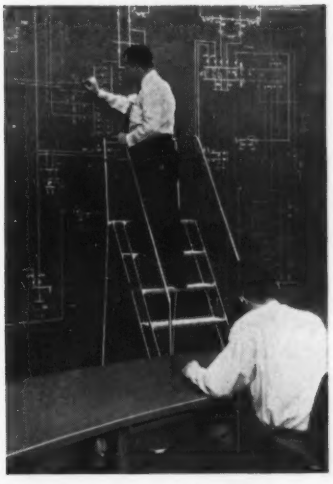
The functions of the engineering, distribution, and plant departments will be coordinated through L. J. Blaize, vice president in charge of engineering and system operation.

E. W. ROGERS



This new Systems Operations Center of the Jersey Central Power & Light Company keeps in touch with remote stations through Bell System channels for telemetering and remote control.

Bell System communications help Jersey Central regulate power transmission



Colored pegs in wall diagram indicate segments of line to be isolated for maintenance work.

Channels for telemetering and remote control enable the Jersey Central Power & Light Company to regulate power transmission every step of the way from generator to home, store and factory.

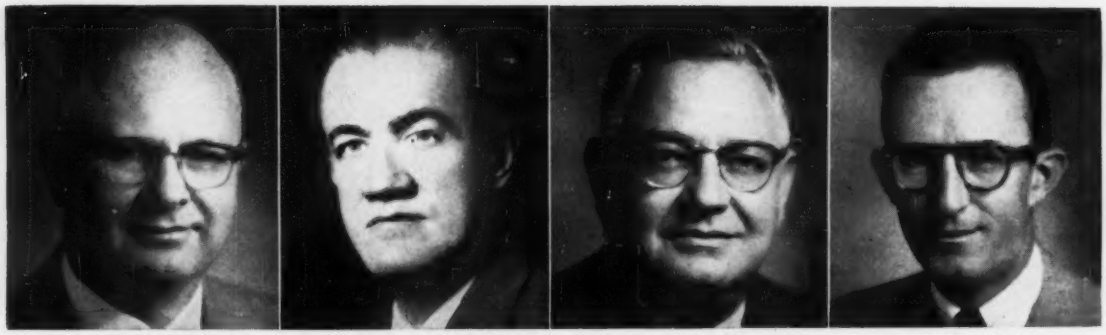
An engineer glances at the dials, which give him a running picture of the system and the changing demands he has to meet—information which has been brought to him by Bell System telemetering channels.

From his position, he switches loads, starts and stops generators and localizes failures—even at distant points—over a network of remote control channels provided and maintained by the Bell System.

If you would like to know more about how Bell System communications can help you, an engineer will be glad to survey your company's needs. There's no obligation. Why not call your Bell Telephone representative today?

BELL TELEPHONE SYSTEM

Private Line Telephone, Private Line Teletypewriter
Channels for: Data Transmission, Telemetering, Remote Control, Telephotograph, Closed Circuit TV



R. L. JEANS | W. L. CARROLL | W. D. LEWIS | A. B. McCLOSKEY

Westinghouse International Names 4 VP's

Westinghouse Electric International Co has elected R. L. Jeans, W. L. Carroll, W. D. Lewis, and A. B. McCloskey to vice presidential positions.

Jeans, general apparatus sales manager since last year, will continue to direct product sales and the servicing of heavy apparatus, general products, and electronic and defense products of the company.

Carroll has been named vice president of finance with responsibility for all treasury and accounting activities of the company. He has been treasurer since 1952 and previously served as assistant treasurer.

Lewis, who formerly served as director of the "sales in U.S.A. for export" division, remains in charge of that activity. He was vice president of Westinghouse Electric Co of Europe from 1951 to 1955.

McCloskey, general area sales manager since last year, will continue his direction of all area sales divisions.

Westinghouse International has also named two new finance officers. They are E. W. B. Lewis, treasurer, and J. P. Boyer, auditor.

PERSONAL BRIEFS

David F. Meek has been elected treasurer of Illinois Power Co to succeed **H. E. Johnson** who retires after 47 years with the utility and its predecessors. Meek is currently serving as assistant secretary and assistant treasurer.

Mississippi Power & Light Co's marketing and development department has named **J. J. Powell,** presently assistant general sales manager, as residential sales manager to replace **E. D. Kenna, Jr,** who has resigned. **B. M. Davis** will assume direct responsibility for commercial sales in addition to his present duties as general sales manager. Recently consolidated industrial sales and development section will be headed by **Frank G. Smith,** at present industrial-commercial sales manager.

Public Service Co of New Hampshire has advanced **Eliot Priest** from manager of the Western Division to director of industrial relations . . . **Earl J. Cutter** has been named assistant manager of the O. H. Hutchings generating station of Dayton Power & Light Co, succeeding **John Calhoun,** transferred to a similar post at the Frank M. Tait station . . . New assistant engineer in Toledo Edison Co's power production department is **James E. Sullivan.**

Marshall M. Hacker, former Southern Division engineer for Public Service Co of Indiana, Inc, has been named division superintendent to succeed retiring **M. G. Howe. Carl A. Rasp,** senior engineer in the Northern Division, succeeds Hacker. Personnel shifts resulting from the retirement of **G. M. McAllister,** south district sales supervisor, include elevation of **J. M. Ackerman** from sales supervisor of the Connersville district to McAllister's post, and promotion of **R. C. Varvil** from senior rural representative in the Bloomington district to the post vacated by Ackerman.

Commonwealth Associates, Inc, has announced the following appointments: **Millard C. Westrate,** assistant chief electrical engineer; **Carl E. Asbury,** electrical systems engineer, electrical engineering department; **Owen A. Lentz,** electrical technical engineer, electrical engineering department; **Bruce S. Moulton,** project engineer on atomic power plant design; and **Francis D. Morgan,** plant electrical design engineer.

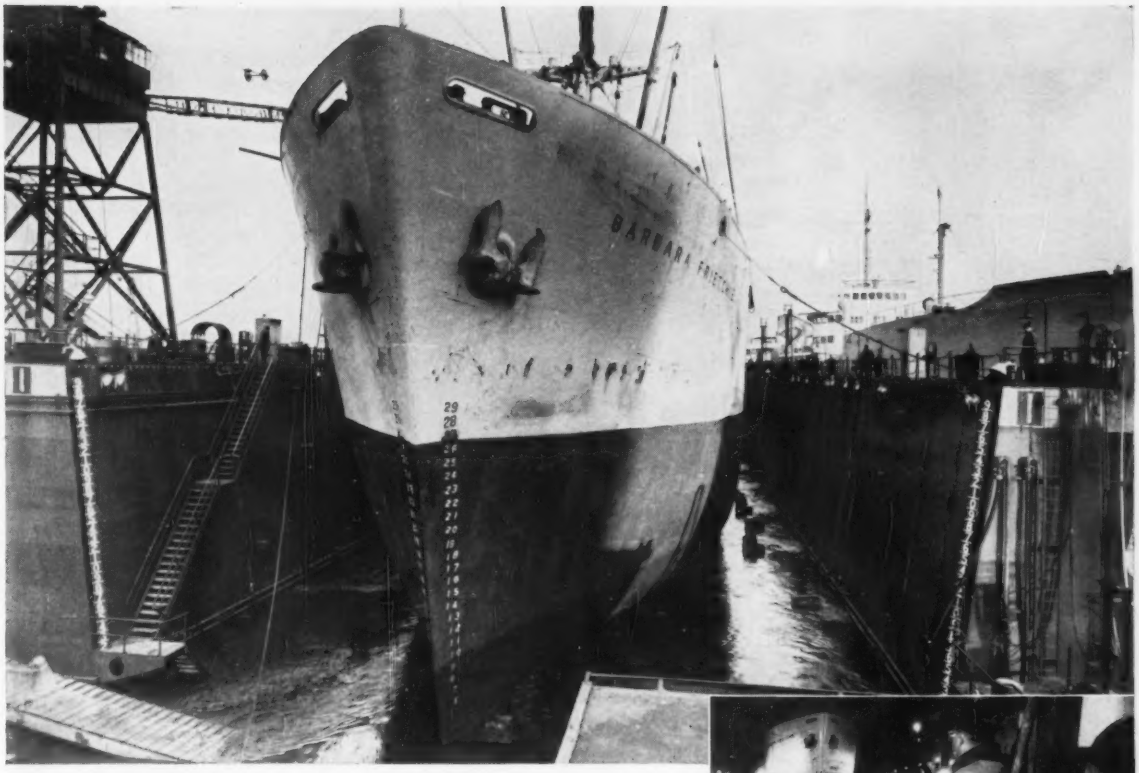
New general manager of GE's large motor and generator department is **Maynard W. Johnson,** manager for three years of the Oakland, Calif., plant of the distribution transformer department.

Clarence H. Linder, vice president of engineering, General Electric Co, has been elected a director of American Institute of Electrical Engineers to fill the vacancy caused by the resignation of **M. S. Coover,** recently elected AIEE president.

OBITUARY

Ralph D. Jennison, 70, retired chairman of the board and former president of New York State Electric & Gas Corp, died in Binghampton.

Thatcher H. Mawson, 52, electrical engineer of Southern Services, Inc, died recently.



CLARK provides Push Button Control of Ships in Drydock

One man at the Clark Master Control Station controls the pumps that regulate water level in each of 18 separate compartments in the bottom of this modern dry dock in Hoboken, New Jersey. Instructions to operator and dock crew are given over a loudspeaker by the dockmaster seen outside the window in the small photograph at the right. Lower illustration shows one of the Clark Control Centers at the side of the dry dock housing controls for pumps and winches which accurately position the ship.

Clark engineered control systems are performing a wide range of vital functions in all kinds of industry. If you have a control problem, let us help you solve it.

Clark Master Control station controls pumps that regulate water level in 18 watertight compartments.

One of the Clark Control Centers housing controls for accurate positioning of ships.

The CLARK CONTROLLER Company
Engineered Electrical Control
7146 East 152nd Street • • Cleveland 10, Ohio

IN CANADA...CANADIAN CONTROLLERS, LIMITED • MAIN OFFICES AND PLANT, TORONTO

Calder Hall: A Forest of Uranium Rods

This close-up shows the top of the first of two atomic piles in Britain's Calder Hall gas-cooled reactor. Preparations here are being made for the insertion of uranium rods. One of the two piles already is working. This is the first full-scale atomic power station in the world. It is to be opened officially Oct. 17, but it already will have been feeding power into Britain's "grid" by then.

NEWS IN BRIEF

ATOMIC

A Russian delegate to a conference in London on physics of nuclear reactors announced that a **new type of thermal column** is being used in the U.S.S.R. The column has a cluster of uranium oxide rods housed in an annulus formed by concentric berylium cylinders . . . In the future, England's Journal of Nuclear Energy will carry a **full translation of the scientific Soviet Journal of Atomic Energy,** and vice-versa . . . Britain's Central Electricity Authority has received an official OK on a proposed nuclear power station to be at Bradwell in Essex. Sets of turbo-generators will develop about **200,000 kw** powered by two carbon dioxide, gas-cooled, graphite-moderated reactors. Construction to start in 1957 . . . **Canada reports** work will start in August on a $14.5-million **atomic demonstration power plant** to be built near Des Joachimes, Que., 150 miles northwest of Ottawa. The plant is to generate 20,000 kw . . . **Philip Sporn,** president of American Gas & Electric Co, told New York Security Analysts that competitive atomic energy should arrive in the U.S. by 1975, and will be needed to meet electrical demands of that day.

HYDRO

Washington State Institute of Technology has five **working models of Pacific Northwest dams** built. One was built so fast on the laboratory site that officials now hope to get a building thrown up around it before winter sets in. A 5,300-sq ft addition to the Institute's hydraulic labs is to be completed before winter, devoting 4,400 sq ft to model studies and 900 sq ft to such things as **fish ladder investigations.**

Federal Power Commission has granted construction license to **Chelan County Public Utility District** for Rocky Reach dam on Columbia River near Wenatchee. It will be a 630,000-kw project . . . Last two generators in a battery of fourteen 75,000-kw machines have been installed at McNary dam near Walla Walla, Wash. They should be generating by Jan. 1.

A $280-million scheme to produce 1 million kw from a **hydro plant 600 ft underground** in the mountain country of Southwest New Zealand is being considered by the country's government.

A joint operating agency to build and operate a 200,000-kw steam plant and several small hydro plants is proposed by Washington Public Utility District Association. If adopted by participating PUD's, hydro plants would spring up on Hamma Hamma River in Mason County, at Sunset Falls on Skykomish River, Lake Isabel, and May Creek, all in Snohomish County, and at Packwood Lake in Lewis County.

MISCELLANEOUS

National Safety Council Award of Honor went to Pacific Gas & Electric Co for second consecutive year in recognition of successful efforts to reduce lost-time industrial accidents . . . Celebration of Southern California Edison Co's 60th anniversary this month coincides with Pres Harold Quinton's announcement that the company will pass the **billion dollar mark in plant investment** late this year . . . **Two-day construction of a temporary substation** has left Central Illinois Light Co substation personnel panting but proud. To relieve excessive overloading of its Gale substation, Cilco took advantage of necessary materials located close at hand and of available beams in an existing substation.

Power rationing and some industrial cutbacks have been put into effect in certain parts of New Zealand to meet a growing shortage of power. Some companies now are planning to reduce working hours. A shortage of generating stations and the abnormally dry summer are blamed . . . New York State Meter Engineers group has set up a **Good Meter Practices** committee to compile a handbook in conformity with the state's Public Service Commission's rules and regulations for testing watthour meters. The book will record practices acceptable under the current code, interpret good practice techniques, and promote conformity with PSC's rules in order to obtain high metering accuracy at low cost.

Tuscon Gas, Electric Light & Power Co plans expansion and construction of a service center to cost a little under a half million dollars.

O.Z. pull boxes

SAVE TIME! SAVE SPACE! SAVE MONEY!

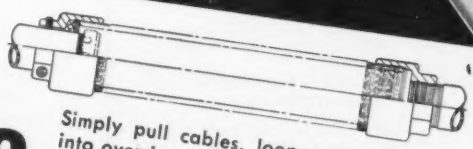
The easiest, most economical way to speed installation of conduit—of any size from ½" to 6"—is to use O. Z. Pull Boxes. Two hot dip galvanized malleable iron units fitted to an oversize length of pipe replace the conventional, bulky and costly pull box . . . cuts labor time in half!

O. Z. Pull Boxes are available in four designs: standard (Type "PB"); weather-tight (Type "PBW"); explosion proof and thin wall conduit. The oversize sleeve can be cut to required length "on the job" from standard conduit, or furnished to your specifications by O. Z.

Call your local O. Z. distributor, or write direct to the company for complete information.

1. Slide head "A" with sleeve over the conduit end. Attach head "B" on opposite conduit.

TYPE "PBW"



2. Simply pull cables, loop and feed back into oversize sleeve. Slide head "A" with sleeve into position and screw sleeve into head "B". Tighten set screws to lock "A" in position.

O.Z. ELECTRICAL MANUFACTURING CO., INC.

262 BOND STREET • BROOKLYN 17, N. Y.

San Francisco Plant: 749 Bryant St. • GArfield 1-7846
Chicago Office & Warehouse: 406 So. Cicero Ave. • ESterbrook 9-0326

CAST IRON BOXES
CABLE TERMINATORS
POWER CONNECTORS
SOLDERLESS CONNECTORS
GROUNDING DEVICES
CONDUIT FITTINGS

EMPLOYMENT OPPORTUNITIES

NATIONAL COVERAGE

RATES

DISPLAYED

The advertising rate is $19.15 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.
Subject to Agency Commission.

UNDISPLAYED

$1.50 per line, minimum 3 lines. To figure payment count 5 average words as a line. Box Numbers—counts as 1 line.
Position Wanted ads, ½ of above rate.
Discount of 10% if full payment is made in advance for 4 consecutive insertions.
Not subject to Agency Commission.

Send NEW ADS and inquiries to Classified Advertising Division of ELECTRICAL WORLD, P.O. Box 12, N. Y. 36, N. Y.

POSITION OPEN IN BANKING FIELD

Large New York Bank Has Position Open In Its Expanding Public Utilities Department

We are looking for a man between the ages of 30 and 35 who has a college degree and who has had experience in electric or gas utilities —preferably in finance, business research, rates and economics.

This is a permanent position through which the proper person will reach the officer category. Salary commensurate with qualifications and experience.

Those who are interested in this opportunity should write—

P-2392, Electrical World
Class. Adv. Div. P.O. Box 12, N.Y. 36, N.Y.

ENGINEERS ELECTRICAL

Senior & Asst Engineers

DESIGN AND OPERATION

Plants and Substations
Distribution and Transmission
Underground Network Systems
Relay Systems
Technical Studies
System Planning

Required by Operating Division of long established service and supervisory organization for large group of Electric Utilities, located in eleven Latin American countries. Engineering assignments varied and interesting with responsibility. Some travel. Location New York. Usual employe benefits. Reply giving age, education, experience, *personal particulars and salary expected.*

AMERICAN & FOREIGN POWER COMPANY INC AND SUBSIDIARIES

2 Rector Street, New York 6, New York
Personnel Dept.—DI 4-4400—14th Floor.

OPPORTUNITIES
(in the field of measurements and testing)
FOR EXPERIENCED ELECTRICAL ENGINEERS AND E. E. GRADUATES

Small, well-established, employee-owned company, offering usual benefits plus potential profit-sharing and stock ownership.

Testing • Analyses • Inspection • Calibration • Evaluation

Interesting and important assignments covering broad range of testing, engineering analyses and inspection in electrical, electro-mechanical and environmental fields on all kinds of electrical materials, instruments, apparatus and equipment. High order of personal responsibility in work and client relationships. Also openings for engineers and specialists experienced in watthour meter and instrument testing and calibration; component evaluation; electrical appliances; air-conditioners; high-voltage cable.

In-Plant Work

Openings for engineers and specialists familiar with in-plant cable testing and inspection, instrument and test apparatus checking and calibration; also in-plant audits of inspection; quality control, and specification compliance procedures.

ETL

Please send resumé of education and experience, stating age and salary requirements, to

Gordon Thompson, Chief Engineer
Electrical Testing Laboratories, Inc.
2 East End Avenue, New York 21, N. Y.
Telephone BUtterfield 8-2600

Electrical Engineers Designers

BECHTEL

Offers you immediate long range engineering opportunity in

San Francisco
or
Los Angeles
California

Engineers, designers and draftsmen required with the following experience:

Electrical Sub-Station
Hydro-Electric Power Plant
Steam Electric Generating Station

Liberal relocation allowances for you and your family

Send Resume to Don Palmer
Industrial Relations Division

BECHTEL CORPORATION
220 Bush Street
San Francisco 4, Calif.

For personal interview phone:
Paul Keating, Murray Hill 7-7100, New York City
Joe Braddick, Fairfax 3-2401, Houston, Texas
Bill Milligan, Tucker 1549, Los Angeles, Calif.

REPLIES (Box No.): Address to office nearest you
c/o This publication Classified Adv. Div.
NEW YORK: P. O. Box 12 (36)

CHICAGO: 520 N. Michigan Ave. (11)
SAN FRANCISCO: 68 Post St. (4)
LOS ANGELES: 1125 W. 6th St. (17)

POSITIONS VACANT

Sales Engineer San Francisco for proposal preparation and sales correspondence on outdoor oil circuit breakers, power switching equipment, substations, electrical power connectors and bus supports. E.E. graduate with 2 years similar sales experience or equivalent. Salary $5500 to $6000. Federal Pacific Electric Company, 5815 Third Street, San Francisco 24, California.

System Dispatcher excellent opportunity for man with experience on high voltage transmission network. Location in Midwest. Reply P-2435, Electrical World, giving qualifications and expected salary.

EMPLOYMENT SERVICES

Salaried Personnel, $5,000-$30,000. This Confidential service established 1920, is geared to needs of high grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Jira Thayer Jennings, P. O. Box 674, Manchester, Vermont.

Salaried Positions $5,000 to $35,000. We offer the original personal employment service (established 46 years). Procedure of highest ethical standards is individualized to your personal requirements. Identity covered, present position protected. Ask for particulars. R. W. Bixby, Inc., 558 Brisbane Bldg., Buffalo, N. Y.

POSITION WANTED

Graduate Electrical Engineer, six years experience with large utility company. Age 31. Experience in distribution system design, distribution substation design, voltage conversions, cost analysis, cost estimates, supervision of construction and operations. Desires position with utility company or company associated with utilities. PW-2554, Electrical World.

SR. ELECTRICAL ENGINEER

Foreign Employment

For responsible staff position which involves planning and staff engineering of new electrical power generation plants utilizing steam or gas combustion turbines and related facilities for major oil installation in Saudi Arabia.

Must be a graduate electrical engineer with proven supervisory ability with minimum ten years' experience in planning, design and study of utilities systems, power generation, transmission, distribution and related work. Minimum salary $1000 monthly plus allowances and generous benefits.

Write outlining personal history and work experience. Please include telephone number.

Recruiting Supervisor, Box 180

ARABIAN AMERICAN OIL COMPANY
505 PARK AVENUE
NEW YORK 22, NEW YORK

TRANSFORMER DESIGN ENGINEER

Unusual opportunity to advance quickly to executive in charge of new transformer plant

Nationally known electrical manufacturer with strong financial position expanding facilities to include both distribution and power transformers.

The man we want will be holding a responsible position with heavy experience in the design and manufacture of modern transformers.

Future opportunities unlimited. Salary open. Give Personal history and work experience. Information strictly confidential. We will contact no references without your permission.

P-2309, Electrical World, 520 N. Michigan Ave., Chicago 11, Ill.

OVERSEAS OPPORTUNITIES

Attractive staff positions open with affiliates of

STANDARD OIL COMPANY (N. J.) in SOUTH AMERICA

ELECTRICAL ENGINEER—will conduct various project assignments including transmission, distribution, control, lighting and communication systems.

ELECTRICAL SUPERVISOR—will provide advice and assistance in the installation and maintenance of electrical equipment, telephone, instruments and gauges.

ELECTRICAL INSTRUCTOR—will supervise instruction of apprentices, prepare training materials, plan training schedules, and conduct 'on-the-job' instruction in large modern oil refinery.

— WRITE —

giving complete address, age, marital status, education and details of previous experience to—

BOX 308 E
Radio City Station
New York 19, New York

"SEARCHLIGHT" IS Opportunity Advertising

—to help you get what you want—to help you sell what you no longer need.

Take Advantage Of It

For Every Business Want

"THINK SEARCHLIGHT FIRST"

SEARCHLIGHT SECTION

(Classified Advertising)

BUSINESS OPPORTUNITIES · EQUIPMENT - USED or RESALE

RATES

UNDISPLAYED

$1.50 a line, minimum 3 lines. To figure advance payment count 5 average words as a line.

BOX NUMBERS count as one line additional in undisplayed ads.

DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals.)

DISPLAYED

The advertising rate is $14.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page.
EQUIPMENT WANTED or FOR SALE ADVERTISEMENTS acceptable only in Displayed Style.

Send NEW ADVERTISING to Classified Advertising, P. O. Box 12, N. Y. 36, N. Y.

Large Powered Equipment

Prompt Stock Shipment

Renubilt Motors — Generators
Transformers — Circuit Breakers

Special

1—250 Kva. Al. Ch. Type AFR 601 amp.—3 ph. 60 cy. Voltage Regulator. 2400 Volts, ± 10% in ⅝% Steps. Like New—Guaranteed Condition.

BELYEA COMPANY INC.
51 Howell St. Jersey City, 6, N. J.

ELECTRICAL WIRE AND CABLE

—YOUR BEST SOURCE—

- for every industrial and power application
- Odd lengths—long and short—reasonably priced

One of the Largest Stocks in the Midwest

Let us quote on requirements—send your inquiries
We'll also buy your Surplus

Branch Office:
Houston—Walnut 3-4580
FOR YOUR TEMPORARY NEEDS TRY OUR SURPLUS DIVISION

UNIVERSAL WIRE and CABLE Co.
2929 N. Paulina St. Chicago 13, Ill.
EAstgate 7-4777 Code: UNIWIRE

TRANSFORMERS

SPECIAL PURCHASE

five carloads
13800 volt transformers
sizes 25 KVA to 250 KVA
new and slightly used

What can you use?
Write for list and prices

Many other items in stock

TRANSFORMERS WANTED

Reliable rewind and repair service on all makes of transformers

THE ELECTRIC SERVICE CO.
5316 Hetzel St.
Cincinnati 27, Ohio

40 Years' Dependable Service

FOR SALE
300 MCM, 3C, 5 kv CABLE
paper and lead compact sector, insulation .083" x .045" belt, Habirloy lead .105". 3 reels, 1800 feet—1 reel, 1500 feet. Manufacturer's reports available.
KANSAS CITY POWER & LIGHT COMPANY
P. O. Box 679 Kansas City 41, Missouri
R. A. Graves, *Purchasing Director*

FOR SALE
SUBJECT TO PRIOR SALE
200 Westinghouse Type CO, Inverse Time Relays, Rated 0.5/2.5 Amperes, 60 Cycle, with Universal Operation Indicator. In Modern Flexitest Cases Which Can Be Mounted Either Flush or Projection. All in First Class Condition. Can Be Used Interchangeably. Styles Nos. 1271197, 1273197, 1545024 and 1545012. If Interested Contact N. C. Stirewalt, V. P., Central Illinois Public Service Company, Springfield, Illinois.

MEETINGS CALENDAR

AUGUST

ALASKA RURAL ELECTRIC COOPERATIVE ASSOCIATION—Annual Meeting, Palmer, Alaska, Aug. 9-11.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—Heat Transfer Division, First National Conference, Pennsylvania State University, Aug. 11-15.

WESTERN ELECTRIC SHOW AND CONVENTION—Pan Pacific Auditorium and Ambassador Hotel, Los Angeles, California, Aug. 21-24.

SEPTEMBER

NORTHWEST PUBLIC POWER ASSOCIATION, INC—Meter School, Oregon State College, Corvallis, Oregon, September 10-14; Accounting Section, Cascadian Hotel, Wenatchee, Washington, September 11-14.

EDISON ELECTRIC INSTITUTE—Organization Meeting, sponsored jointly with AGA, Edgewater Beach Hotel, Chicago, Ill., Sept. 13-14; Industrial Relations Round Table Conference, Drake Hotel, Chicago, Ill., Sept. 17-19; Meter & Service Committee, Purdue University, Lafayette, Ind., Sept. 24-26.

• **MARYLAND UTILITIES ASSOCIATION**—32nd Fall Conference, Cavalier Hotel, Virginia Beach, Va., Sept. 14-15.

PUBLIC UTILITIES ASSOCIATION OF THE VIRGINIAS—38th Annual Meeting, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 14-15.

• **AMERICAN SOCIETY FOR TESTING MATERIALS**—Second Pacific Area National Meeting, Statler Hotel, Los Angeles, Calif., Sept. 16-22.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—3rd Annual Electrical Conference of the Petroleum Industry, Kansas City, Mo., Sept. 17-19.

ILLUMINATING ENGINEERING SOCIETY—National Technical Conference, Hotel Statler, Boston, Mass., Sept. 17-21.

INSTRUMENT SOCIETY OF AMERICA—11th Annual Instrument-Automation Conference and Exhibit, New York Coliseum, Sept. 17-21.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Accounting Conference, Lassen Hotel, Wichita, Kansas, Sept. 20-21.

ATOMIC INDUSTRIAL FORUM, INC—3rd Annual Forum Conference and 2nd Annual Trade Fair, Morrison Hotel and Navy Pier, Chicago, Ill., Sept. 24-28.

PENNSYLVANIA ELECTRIC ASSOCIATION—Annual Meeting, Hotel Wm. Penn, Pittsburgh, Pa., Sept. 25-26.

ELECTRIC COMPANIES PUBLIC INFORMATION PROGRAM—Steering Committee, Blackstone Hotel, Chicago, Ill., September 26; Workshop Conference, Blackstone Hotel, Chicago, Illinois, September 26-28.

OCTOBER

EDISON ELECTRIC INSTITUTE—Prime Movers Committee, Radisson Hotel, Minneapolis, Minn., Oct. 1-3; Area Development Committee Meeting, Oct. 3, and Area Development Committee Workshop, Radisson Hotel, Minneapolis, Minn., Oct. 4-5; Electrical Equipment Committee, Hotel Statler, Cleveland, Ohio, Oct. 15-16; Transmission and Distribution Committee, Hotel Statler, Buffalo, N. Y., Oct. 18-19.

ILLINOIS INSTITUTE OF TECHNOLOGY—12th Annual National Electronics Conference, sponsored jointly by AIEE, Institute of Radio Engineers, University of Illinois, and Northwestern University, Hotel Sherman, Chicago, Ill., Oct. 1-3.

NATIONAL ELECTRONICS CONFERENCE—12th Annual Conference and Exhibition, Hotel Sherman, Chicago, Ill., Oct. 1-3.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Fall General Meeting, Morrison Hotel, Chicago, Ill., Oct. 1-5.

CANADIAN ELECTRICAL MANUFACTURERS' ASSOCIATION—12th Annual Meeting, Sheraton Brock Hotel, Niagara Falls, Ontario, Canada, Oct. 3-5.

MISSOURI VALLEY ELECTRIC ASSOCIATION—Sales and Rural Conference, Hotel President, Kansas City, Mo., Oct. 3-5.

INDIANA ELECTRICAL ASSOCIATION—Annual Convention, French Lick Springs Hotel, French Lick, Ind., Oct. 3-5.

SOUTHEASTERN ELECTRICAL EXCHANGE—Sales Conference, Tides Hotel & Bath Club, St. Petersburg, Fla., Oct. 3-5; Accounting Meeting, Hotel Seville, Miami, Fla., Oct. 10-11.

STANDARDS ENGINEERS SOCIETY—Fifth Annual Meeting, Hotel Willard, Washington, D. C., Oct. 3-5.

INTERNATIONAL ASSOCIATION OF ELECTRIC LEAGUES—Sheraton-Cadillac Hotel, Detroit, Mich., Oct. 3-6.

PENNSYLVANIA ELECTRIC ASSOCIATION—Electric Equipment Committee, Arlington Hotel, Binghamton, N. Y., Oct. 4-5.

ROCKY MOUNTAIN ELECTRICAL LEAGUE—Annual Fall Convention, Broadmoor Hotel, Colorado Springs, Colo., Oct. 7-10.

INTERSTATE POWER CLUB—Hotel Martinique, New York, New York, Oct. 8.

ILLINOIS INSTITUTE OF TECHNOLOGY—Conference on Computer Applications, Chicago, Ill., Oct. 9-10.

INTER-INDUSTRY FARM ELECTRIC UTILIZATION COUNCIL—National Power Use Workshop, Milwaukee Auditorium, Milwaukee, Wis., Oct. 15-16.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS—Electrification of Machine Tools Conference, Sheraton-Gibson Hotel, Cincinnati, Ohio, Oct. 22-24.

AMERICAN STANDARDS ASSOCIATION—38th Annual Meeting and 7th National Conference on Standards, Hotel Roosevelt, New York, Oct. 22-24.

UNIVERSITY OF TEXAS—Ninth Power Distribution Conference, University Batts Auditorium, Austin, Tex., Oct. 22-24.

NATIONAL SAFETY COUNCIL—44th National Safety Congress & Exposition, Chicago, Illinois, Oct. 22-26.

NATIONAL ASSOCIATION OF CORROSION ENGINEERS—South Central Region Meeting, M & M Building, Houston, Texas, October 23-26.

NORTHWEST PUBLIC POWER ASSOCIATION—Power Use Section, Franklin PUD Auditorium, Pasco, Wash., Oct. 25-26.

MONTANA STATE RURAL ELECTRIC COOPERATIVE ASSOCIATION—Annual Meeting, Lewiston, Mont., Oct. 29-31.

NOVEMBER

NATIONAL RURAL ELECTRIFICATION COOPERATIVE—Region Nine Annual Meeting, Davenport Hotel, Spokane, Washington, Nov. 12-13.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION—Annual Meeting, Traymore Hotel, Atlantic City, New Jersey, November 12-16.

EDISON ELECTRIC INSTITUTE—Industrial Relations Committee, EEI Headquarters, New York, N. Y., Nov. 15; Accident Prevention Committee, Statler Hotel, Hartford, Connecticut, November 26-28.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS—22nd National Exposition of Power and Mechanical Engineering, Coliseum, New York, N. Y., Nov. 25-30.

• **GREAT LAKES CONFERENCE OF RAILROAD AND UTILITIES COMMISSIONERS**—First Annual Convention, Greenbrier Hotel, White Sulphur Springs, W. Va., Nov. 29-30.

DECEMBER

INSTITUTE OF RADIO ENGINEERS—2nd Instrumentation Conference, Biltmore Hotel, Atlanta, Ga., Dec. 5-7.

EDISON ELECTRIC INSTITUTE-AMERICAN GAS ASSOCIATION—1957 Conference Planning Committee, EEI-AGA Headquarters, New York, N. Y., Dec. 6-7.

• Additions this week.

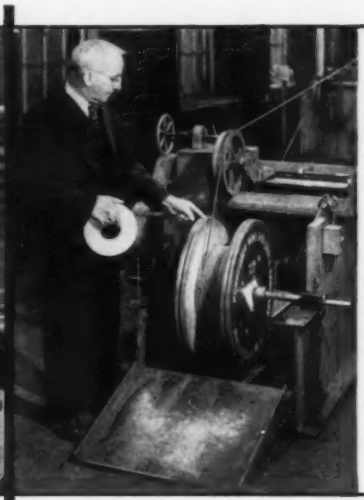
CHASE *the name to remember*

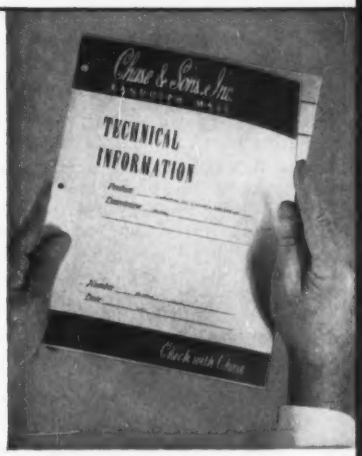
for

LAMINATED INSULATION MATERIALS

◀ Typical of the many Chase products designed for the electrical industry is this generator application where rag paper or kraft paper is combined with DuPont Mylar ® to suit your particular insulation requirements. Chase Slot Insulation comes in sheets, rolls or cuffed.

Complete technical data on Glasterra, or Chasbestos (a combination of asbestos sheet and polyester film) will be sent you upon request. Specifications and samples of all Chase products are available . . . and Chase engineers will gladly help you solve your electrical insulation problems. Chase & Sons, Inc., Randolph, Massachusetts. ▼





▲ Another application where Chase laminated insulation material is used is shown above where double thickness slot insulation is being used in a 15 HP A.C. induction motor. All Chase products are manufactured to meet the highest specifications . . . of the best materials available.

▲ Diversification of Chase product line is further indicated by this illustration showing a development engineer at Kennecott Wire & Cable Co. examining magnet wire insulated with Chase Glasterra Tape. Glasterra is a combination of asbestos sheet, glass yarn or fabric and silicone varnish.

CHASE

ELECTRICAL INSULATING TAPES AND MATERIALS

New Booklet Explains Today's Power Issues

TVA financing, partnership, and preference clause are discussed by Newsweek writer

Today's power issues are explained in down-to-earth fashion for Mr and Mrs John Q. Public in a new booklet available from Electric Companies Public Information Program. The 16-page publication, "Partnership vs Public Ownership," is a compilation of recent columns written by Raymond Moley for Newsweek magazine.

Moley takes the major issues of the day, the really hot political issues—TVA bond financing, partnership, Hells Canyon, the preference clause—and gives factual explanations of the political forces and issues involved.

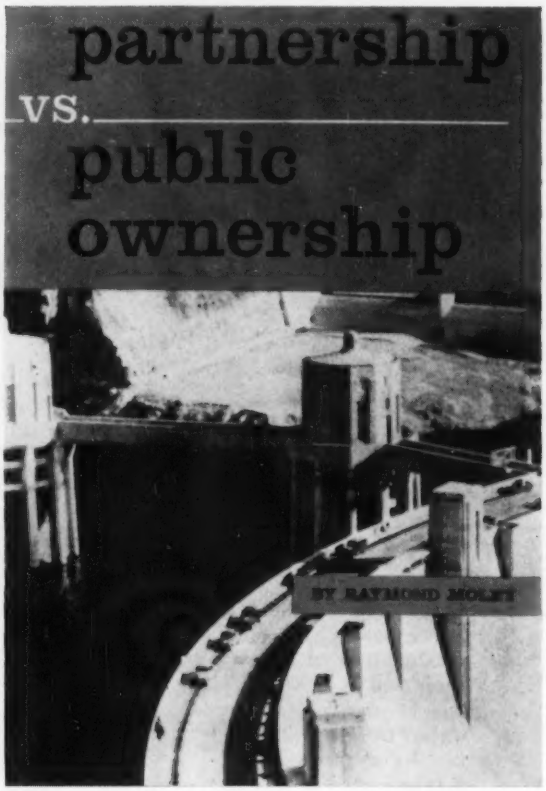
As an example of Moley's approach, here is a paragraph from his discussion of the Kerr Bill which proposes that Tennessee Valley Authority issue its own revenue bonds:

"Never was an innocent and sound idea so transformed. Instead of strictly keeping the TVA responsible to Congress, it would remove any effective control by Congress. Instead of lowering the level of public debt, it would create new and unlimited obligations. Instead of limiting the growth of the TVA to the area for which it was originally created, the Kerr Bill would give it the means to proliferate in all directions. In short, the Kerr Bill is a charter of monopoly."

In other discussions, Moley explains the Eisenhower Administration's partnership policy and gives several illustrations of how this policy is put to work successfully in the Northwest.

Turning to the Hells Canyon issue, Raymond Moley gives factual answers to the three main charges from public power groups: "That President Eisenhower has 'given away' something; that the Idaho Power dams will foreclose the proper development of the Snake River; and that the Idaho Power plan will produce inadequate power at a high price."

The Newsweek writer traces the evolution of the preference theory to the present attempts by public power proponents to carry it over into the government's disposition of atomic power. Moley concludes this series of columns by pointing out the significance of the industrial revolution that is taking place in the Ohio Valley as a result of cheap power from the area's vast coal deposits.



This valuable booklet for informing the public on today's power issues is available through the Electric Companies Public Information Program, 2 West 45th St, New York 36, N. Y. Price is 7¢ a copy for quantities under 100 and 6¢ each for orders of more than 100.

PUBLIC RELATIONS BRIEFS

Iowa P&L's Community Relations Pays Off

The American Institute of Management has added Iowa Power & Light Co to its list of excellently managed companies. In an analysis of Iowa P&L, the Institute ascribed the utility's success to a progressive outlook and alertness to good community relations in its service and sales policies.

Bulletin Makes Employees PR-Conscious

To keep employees aware of the role they play as individuals in building good customer relations, Arizona Public Service Co has devised a new low-cost program. In a special bulletin titled "Salute," the utility reprints letters and favorable comment submitted by customers and others impressed with the company's operations. The bulletin is published twice monthly and displayed on 120 employee bulletin boards. The utility's art department handles all art work, and the treasury department does the printing.

Television Films Tell of Vepco Work

Virginia Electric & Power Co has sent two short movies and scripts to television stations for news casts. One movie is on Roanoke Rapids construction and the other on a new 230-kv line. The company is contemplating the filming of a longer film on the Vepco system.

Why be half safe?

Specify AUTO-SPEED interruption . . . 3E Air Interrupter Switches

Howard Shatzer, 3E field engineer, checking an Air Interrupter Switch before shipment.

What is **Auto-speed interruption** . . . an automatically produced interruption that always occurs at the same point in the switching operation, and always takes the same time (one-half cycle). Human error is eliminated from the switching action by a trigger spring mechanism which trips the switch at a pre-set point. Contacts are separated inside a dry type interrupter unit.

Specify safety for personnel and equipment. No exposed Arc. 3E Air Interrupter Switches will not produce external arcing dangerous to men or equipment.

Specify economy Costing less than circuit breakers and with interrupting capacity not found in air break disconnects, 3E Air Interrupters are ideal for . . . interrupting magnetizing charging current of transformers . . . interrupting charging current of lines and busses . . . interrupting exciting current of feeder regulators . . . interrupting load currents to rated capacity . . . sectionalizing feeders and distribution circuits.

Specify Engineering Ability 3E's staff of engineers is experienced in adapting or combining equipment for complete switching centers or additions to existing units. Designing for unusual needs . . . corrosive or dusty atmospheres, unique space requirements, portable units, or carefully calculating tomorrow's expansion requirements . . . we are geared to handle the unusual.

Howard Noble, 3E Sales Promotion Mgr., demonstrates Air Interrupters in a complete cubicle installation.

Write for Bulletin 152

3E Air Interrupter Switches are made in ratings up to 15 K.V.

ELECTRICAL ENGINEERS EQUIPMENT CO. Melrose Park, Illinois

Representatives in principal cities—in Canada by Power-Lite Devices, Ltd.

Power Re-sale Killed in Boston

State Supreme Court rules Boston Edison can stop wholesale rates; $1 million annual net revenue increase estimated

A far-reaching decision allowing the Boston Edison Co to discontinue selling electricity at wholesale rates to owners of downtown office buildings who re-sell such power to their tenants was issued by the Supreme Judicial Court of Massachusetts on July 26.

The Massachusetts Department of Public Utilities had sanctioned a new rate schedule in 1953 to do away with such re-sale practice, which has been in use for about 44 years, but the commission's decision in favor of the company was appealed to the high court of the state by the real estate interests concerned. These included the Boston Real Estate Board, Quaker Building Co, First Realty Corp, and a number of other building owners in the heart of the city and parts of the Back Bay District.

Since 1911 the Quaker Co, for example, has supplied steam and electricity to 83 customers living in the Devonshire, Summer, Franklin, High, and Federal street sections of the city of Boston.

The DPU estimated three years ago that discontinuance of the re-sale practice could increase Boston Ed's net revenue by about $1 million annually by converting building tenants to retail customers of the utility. The commission pointed out that the practice has resulted in the supply of electricity by the landlords to their tenants on the basis of competition with the utility at rates fundamentally unsound and against the public interest. Such rates, the commission held, deprive the company of revenue which it must obtain by addition to the bills of the other customers.

The appeal of the real estate people to the state supreme court blocked the change from the old practice pending the decision of that body. The finding was written by Justice Arthur E. Whittemore and covered about 27 typewritten pages.

It dismisses the appeals of the real estate interests in a ruling which states that property owners re-selling power to tenants will not be entitled to any reduction in rates, and which declares that there is no rule of law to prevent Boston Ed from discontinuing the practice.

Vermont PSC Issues Depreciation Order

The Vermont Public Service Commission has issued a temporary order to all utility companies in the state as to the accounting treatment of accelerated depreciation under section 167 of the Internal Revenue Code of 1954. The order was dated March 5, 1956. The order said:

1. Depreciation on property subject to accelerated depreciation pursuant to the company's election under Section 167 of the Internal Revenue Code of 1954, shall be recorded on the company's books of accounts in the same manner as its other properties, and the company shall accrue depreciation at rates consistent with its rates for like property not subject to accelerated depreciation.

2. In any year that accelerated depreciation taken pursuant to a company's election of Section 167 of the Internal Revenue Code of 1954, results in the payment of a lesser amount of income taxes, the difference in the amount of such taxes shall be charged to "Provision for Future Income Taxes" and a credit to "Reserve for Future Income Taxes."

3. In any year in which a company's tax depreciation deduction on any of its properties subject to accelerated depreciation is less than it would have been if depreciation had been computed on the straight-line method, charges shall be made to "Reserve for Future Income Taxes" and credits shall be made to "Provision for Future Income Taxes" for the amount of the difference in income taxes resulting from such lower tax depreciation deductions.

4. Each company electing to adopt liberalized depreciation shall file with its annual report a statement or schedule explaining in detail the higher or lower tax depreciation resulting from such adoption, and the tax effect of such difference.

IT IS FURTHER ORDERED that the accounting procedures prescribed in the preceding paragraph of this order are established for accounting purposes only.

FINANCIAL BRIEFS

United Illuminating Co will pay Oct. 1 a quarterly common stock dividend of 32½¢ a share on the new common. This is equivalent to 65¢ on shares outstanding prior to 2-for-1 split. Company paid 60¢ a share previously.

New Financing—Southern California Edison Co is planning to sell competitively on Sept. 5 $40 million refunding mortgage bonds due 1986 . . . **Northern States Power Co** also is planning to sell competitively $15 million first mortgage bonds on Sept. 12.

Detroit Edison Co will offer its stockholders of record Aug. 17 $59,778,900 of 3¾% convertible debentures due 1971 on the basis of one right for each share held. A payment of $100 and 21 rights will be required to subscribe for each $100 principle amount of debentures.

Cleveland Electric Illuminating Co has dropped its "budget billing" system (reading customers' meters every second month and in alternate months issuing a "budget bill" based on recent

(*More Briefs on page* 172)

POSTING 130,870,948 new shares involved making a million and a half entries in 5 weeks. Guaranty's large staff of experienced personnel handled a tremendous number of clerical details and is available to other companies seeking stock transfer service.

21 TONS of mail were sent to Jersey Standard's 326,000 stockholders. While this operation was in progress, Guaranty was also handling transfer and registrar work for about 1,000 other classes of stock.

MODERN EQUIPMENT was used by Guaranty to help speed up operation. Here, one of Guaranty's staff technicians feeds instructions to the bank's electronic calculator.

PROFESSIONAL GUIDANCE at every step of the way was provided by Guaranty. L. to r.: William J. Neil, Howard M. Ashley, Matthew J. Whalen, Harry W. Knudsen, and John D. Rippe. These men are part of the team of 504 officers and employees available to every company, large or small, seeking transfer or registrar services.

Guaranty Trust Handles Record Stock Split

Three-for-one stock split of Standard Oil Company (New Jersey) involved 20 million separate operations. Guaranty Trust's experienced personnel and equipment put through record stock split quickly, efficiently.

Recently Standard Oil Company (N.J.) voted a 3-for-1 common stock split. The job, largest of its kind ever undertaken by any bank transfer agent, was handled by Guaranty Trust Company of New York.

Handling any stock split, large or small—in this case the issuance of 1,500,000 new certificates—requires a unique combination of experience, adequate numbers of personnel, modern equipment, and professional know-how. This combination was available to Jersey Standard, as it is available to the hundreds of companies of all sizes for which Guaranty acts as transfer agent or registrar.

EXPERIENCED AND ADEQUATE PERSONNEL. Posting 130,870,948 new shares (involving 1,500,000 certificates) to stockholders' records . . . preparing voting lists . . . these were some of the tasks which Guaranty personnel performed for Jersey Standard. Hundreds of clerical workers were involved in round-the-clock operations at various times.

MODERN EQUIPMENT AND PLANT FACILITIES. In processing the heavy volume of work handled by the staff, ingenious automation methods, plus modern electronic and mechanical equipment were used by Guaranty Trust to implement the handling of the 20 million separate operations: 4,280,000 stencil impressions—3,000,000 signatures—the mailing to stockholders of 21 tons of mail.

PROFESSIONAL ADVICE. From its preliminary stages to completion of the split, this operation called for careful planning. A myriad of questions and problems had to be solved. Guaranty Trust officers, with wide experience in every phase of transfer and registrar work, furnished the specialized professional guidance needed to do the job.

While Jersey Standard's "operation split" was in process, the bank was also paying two of that company's regular quarterly dividends. In addition, Guaranty was performing dividend, transfer, and registrar services for other companies which involved about 1,000 different classes of stock. The number of holders of these classes of stock ranged in size from 120 shareholders to 326,000 shareholders.

HELP ON YOUR TRANSFER PROBLEMS. Whatever the size of *your* company, Guaranty personnel, equipment, and professional guidance are available to perform stock transfer or registrar services for you. If you would like to learn more about the advantages of New York transfer facilities written from the *corporation viewpoint,* write on your business letterhead for a complimentary copy of *"Your Company, Its Stockholders, and the New York Capital Market,"* attention Corporate Trust Stock Transfer Dept. EW-2.

GUARANTY TRUST COMPANY
OF NEW YORK · 140 BROADWAY, NEW YORK 15

Capital Funds in excess of $400,000,000

Fifth Ave. at 44th St., New York 36 · Madison Ave. at 60th St., New York 21
40 Rockefeller Plaza, New York 20 · London · Paris · Brussels

Financial Briefs

(*Continued from page* 170)

average monthly electric usage, adjusted for seasonal variations) in favor of monthly reading and sending of electric bills.

Carolina Power & Light Co has asked North Carolina Public Utilities Commission approval for a certificate of convenience and necessity authorizing purchase of facilities in Greenville for $585,000 and Washington for $43,035.

California Electric Power Co will pay Sept. 1 a quarterly common stock dividend of 19¢ a share as compared with 17½¢ a share in the previous quarter.

United Illuminating Co has placed 50,000 shares $100 par 4.35% preferred stock privately through an underwriting group headed by Chas. W. Scranton & Co and Putnam & Co.

American Gas & Electric Co will pay Sept. 10 a quarterly common stock dividend of 36¢ a share on the new common. This is equivalent to 54¢ a share on the old common which was split 1½-for-1 recently. Prior to the split AGE paid 50¢ a share quarterly.

Kentucky Utilities Co will bill its customers in the Paducah District every other month instead of monthly.

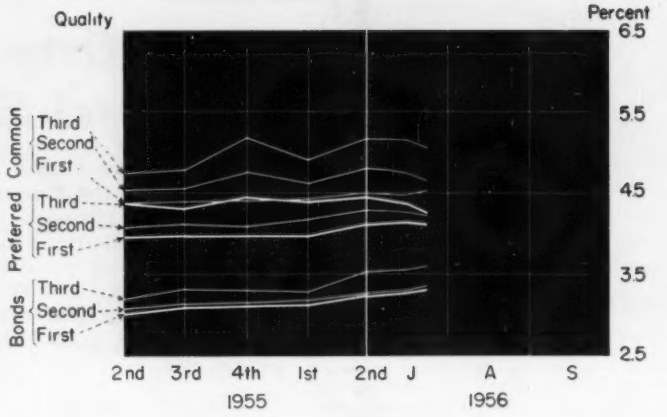
Southern Canada Power Co, Ltd, will pay August 15 a quarterly common stock dividend of the usual 50¢ a share along with an extra of 25¢ a share. No extra was paid last year.

Northern Indiana Public Service Co is offering commonholders 370,894 shares of 4.40% cumulative preference stock in the ratio of one new share for each ten common shares at $40 a share. Record date is July 13 and will expire on August 8.

Rate Briefs

Electric rates should be raised, Commissioner George M. Oliver, Springfield, Ill., Water, Light & Power Department said, if it "is to continue to efficiently serve the people of Springfield."

Today's Utility Yields (%)



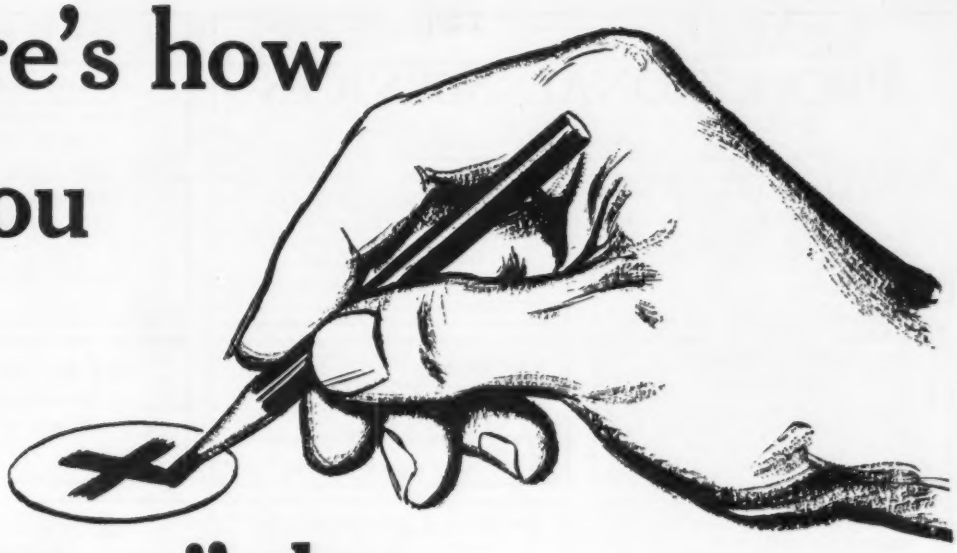
QUALITY	BONDS			PREFERRED STOCKS			COMMON STOCKS		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
July 26	3.31	3.35	3.58	4.16	4.24	4.51	4.26	4.64	5.06
July 19	3.27	3.29	3.56	4.14	4.23	4.48	4.36	4.67	5.11
July 12	3.28	3.29	3.56	4.17	4.24	4.48	4.38	4.74	5.14

Utility Earnings

COMPANY	PERIOD MONTHS	ENDED	NET INCOME 1956	NET INCOME 1955	EARNINGS PER COMMON SHARE 1956	EARNINGS PER COMMON SHARE 1955
Alabama Power	12	June	$14,843,500	$13,544,404	$....	$....
Arkansas Power & Light	12	June	5,453,211	6,945,037	....	....
Carolina Power & Light	12	June	9,821,142	8,613,650	1.70(a)	1.58(a)
Central Hudson Gas & Electric	12	June	3,643,227	3,346,120	1.10	1.02
Central Illinois Public Service	12	June	9,139,661	8,401,745	2.45	2.23
Central Power & Light	12	June	7,520,132	6,775,173	....	....
Central Vermont Public Service	12	June	1,374,394	1,404,189	1.24(b)	1.29(b)
Consumers Power	12	June	31,193,836	27,657,076	3.34(b)	3.10(b)
Detroit Edison	12	June	27,713,918	24,602,495	2.45(b)	2.28(b)
Florida Power & Light	12	June	13,521,026	10,985,362	2.25	1.83
Georgia Power	12	June	14,479,975	13,342,985	....	....
Houston Lighting & Power	12	June	16,095,540	13,619,891	2.69	2.27
Interstate Power	12	June	3,003,738	2,779,910	1.06	1.00
Iowa Southern Utilities	12	June	1,464,990	1,298,594	1.79(c)	1.57(c)
Kansas City Power & Light	12	June	9,007,562	7,227,289	2.77	2.15
Kansas Power & Light	12	June	6,429,521	5,071,014	2.05	1.52
Kentucky Utilities	12	June	5,909,215	6,311,530	....	....
Long Island Lighting	12	June	12,477,335	9,718,551	1.54(b)	1.28(b)
Middle South Utilities, consolidated	12	June	15,055,302	14,983,307	1.98	1.97
Montana Power	12	June	8,854,905	8,043,928	3.08	2.75
New York State Electric & Gas	12	June	11,196,155	9,951,347	2.88(f)	2.75(f)
Northern States Power	12	June	19,912,009	18,223,895	1.18(g)	1.13(g)
Oklahoma Gas & Electric	12	June	8,857,535	7,800,326	2.28(h)	2.17(h)
Philadelphia Electric	12	June	34,611,451	31,824,935	1.80(i)	1.80(i)
Portland General Electric	12	June	5,072,800	4,798,165	1.69	1.60
Public Service of New Hampshire	12	June	4,212,772	4,097,912	1.22(b)	1.37(b)
Shawinigan Water & Power	6	June	5,430,668	4,128,371	2.02	1.50
Southern California Edison	12	June	30,721,732	28,307,487	3.36	3.10
Southern Co, consolidated	12	June	28,319,298	24,416,447	1.44(j)	1.35(j)
Southern Indiana Gas & Electric	12	June	2,345,071	2,583,816	1.94(k)	2.38(k)
Tampa Electric	12	June	3,149,955	3,004,332	1.48(b)	1.52(b)
Virginia Electric & Power	12	June	20,151,832	18,346,073	2.67	2.44

Notes—(a) Based on 4,830,000 shares in 1956 and 4,600,000 shares in 1955; (b) Based on average shares; (c) Based on 755,179 shares in 1956 and 748,083 shares in 1955; (f) Based on 3,337,475 shares in 1956 and 3,034,068 shares in 1955; (g) Based on 14,089,328 shares in 1956 and 13,418,408 shares in 1955; (h) Based on 3,283,262 shares in 1956 and 2,984,783 shares in 1955; (i) Based on 12,196,310 shares in 1956 and 12,064,078 shares in 1955; (j) Based on 19,594,946 shares in 1956 and 18,087,643 shares in 1955; (k) Based on 996,363 shares in 1956 and 913,333 shares in 1955.

here's how you "govern" the government



Much as we revere and respect this system of ours, we don't want the government running our lives.

The best government is one that's closest to the people. And there's just one way to keep it under control.

Vote.

Every time you get a chance.

Vote November 6, for sure.

Vote to elect the ones you want representing you. To keep the ones who are doing you proud. To get rid of the ones who are not so hot.

You're the boss, however you vote. No matter who's elected, you pay their salaries and paint their offices and keep watching over them as they work.

Even if the ones you're "agin" happen to win, they're obligated to the minority, too. They're servants of *all* the people, not just those who voted for them.

Your vote prods, approves, protests, demands, restrains, rewards.

Vote—so you and your children after you always can.

THE AMERICAN HERITAGE FOUNDATION

PUBLIC SERVICE ADVERTISING COUNCIL

See You at the POLLS!

PROFESSIONAL SERVICES

CHAS. T. MAIN, INC.
Engineers

Electric, Steam and Hydraulic Projects,
Investigations, Reports, Appraisals
Designs and Construction Supervision

80 Federal St., Boston 10, Mass.

BARKER & WHEELER

Utility and Industrial Valuations, Design and Construction of Power Systems, Water Supplies, Sewerage and Sewage Disposal, Factory Production and Cost Control Systems.

11 Park Place, New York City
36 State Street, Albany, N. Y.

HARZA ENGINEERING CO.
Consulting Engineers

Calvin V. Davis — E. Montford Fucik
Richard D. Harza
Hydroelectric Plants and Dams
Transmission Lines
Flood Control, Irrigation
River Basin Development

100 West Madison Street — Chicago 6

PIONEER SERVICE & ENGINEERING CO.

Consulting and Design
Engineers . . Purchasing
Specialists in Financing
Accounting and Oother Operations

231 So. La Salle St. — Chicago 4

BLACK & VEATCH
Consulting Engineers

Electricity—Water—Sewage—Industry
Reports, Design, Supervision of Construction
Investigations, Valuations and Rates

4706 Broadway — Kansas City 2, Missouri

HOOSIER ENGINEERING COMPANY

Erection and Maintenance of
Electrical Transmission and Distribution Lines

1384 Holly Avenue, Columbus, Ohio

REIS & CHANDLER, INC.

ADVISORS TO UTILITIES

Financing—Rate of Return

30 Vesey Street, — New York 7, N. Y.

THEODORE D. BROSS LINE CONSTRUCTION CORP.

Steel Tower & Wood
Transmission Lines

Distribution & Maintenance

175 Enfield St. — Hartford, Conn.

JACKSON & MORELAND, INC.
Engineers and Consultants

Design and Supervision of Construction
Reports—Examinations—Appraisals
Machine Design—Technical Publications

Boston — New York

SANDERSON & PORTER ENGINEERS

Design
Construction

New York — New York

DAY & ZIMMERMANN, INC.
Engineers

Design - Construction - Management
Reports and Valuations

New York — Philadelphia — Chicago

M. W. KELLOGG
Piping System Design Analyses

Unique model tester as well as modern digital computer facilities available for low cost, accurate flexibility analyses of the most complex piping systems.

The M. W. Kellogg Company
711 Third Ave., New York 17, N. Y.

SARGENT & LUNDY
Engineers

140 South Dearborn St.

Chicago, Ill.

DOBLE ENGINEERING COMPANY
Electrical Insulation Engineers

Field Testing and Maintenance of High Tension Insulation, Special Problems in Electrical Communications

Office and Laboratory: Doble Park
Box 341, Belmont 78, Mass. (6 miles from Boston)
Branch Office: 20 N. Wacker Dr., Chicago, Ill.

THE KULJIAN CORPORATION
Engineers - Constructors - Consultants

POWER PLANT SPECIALISTS
(Steam, Hydro, Diesel)
Utility • Industrial • Chemical

1200 N. Broad St., — Philadelphia 21, Pa.

F. W. SCHEIDENHELM
Consulting Engineer

Hydraulic Engineering, Hydro-electric Development, Water Supply, Flood Control, Engineering Problems relating to Water Rights and Water Power Law. Appraisals

50 Church Street, — New York 7, N. Y.

ELECTRICAL TESTING LABORATORIES, INC.

Electrical, mechanical, photometric, radiometric and chemical laboratories, rendering testing, research and associated services, including certification, inspections at factories and field investigations.

2 East End Avenue at 79th St., New York 21, N. Y.

PETER F. LOFTUS CORPORATION
Design and Consulting Engineers

Electrical • Mechanical • Structural
Civil • Thermodynamic • Architectural

First National Bank Building
Pittsburgh 22, Pennsylvania

SVERDRUP & PARCEL, INC.
Engineers - Architects

Design, Construction Supervision
Steam and Hydro Power Plants
Power Systems - Industrial Plants
Studies - Reports

St. Louis — San Francisco — Washington

ROBERT E. FOLEY CONSTRUCTION CORPORATION

Construction & Maintenance
Transmission—Distribution—Communication Lines
Substation, Radio and Television Towers

48 Griswold St. — Binghamton, N. Y.

N. A. LOUGEE & COMPANY
Engineers and Consultants

REPORTS — APPRAISALS
DEPRECIATION STUDIES — RATE CASES
BUSINESS AND ECONOMIC STUDIES

120 Broadway — New York

F. A. TUCKER, INC.
Contractors—Engineers

specialize in
Distribution - Transmission - Telephone lines - Maintenance - Roads - Bridges Dams

Main Office — 38½ Center Street, Rutland, Vt.
Branch Office — Little Rock Road, Charlotte, N. C.

FORD, BACON & DAVIS
Engineers

DESIGN • CONSTRUCTION
VALUATIONS • REPORTS

New York • Chicago • Los Angeles

LUCAS & LUICK
Engineers

DESIGN, CONSTRUCTION, SUPERVISION, OPERATION, MANAGEMENT, APPRAISALS, INVESTIGATIONS, REPORTS, RATES

231 S. LaSalle St., Chicago

UTILITIES LINE CONSTRUCTION COMPANY, INC.
Construction and Maintenance

Transmission - Distribution
Electric and Telephone Lines
Consultants

505 York Road — Jenkintown, Pa.

GILBERT ASSOCIATES, INC.
Engineers • Consultants • Constructors
Reading, Pa.
Engineering and Design • Construction Supervision
Industrial • Sanitary • Safety
Chemical Laboratory Services
Business and Economic Research
Industrial Relations • Purchasing

New York — Philadelphia — Washington
Rome — Manila — Medellin

THE LUMMUS COMPANY
Engineers and Constructors

385 Madison Ave., New York, N. Y.

Chicago . . Houston . . London
Paris . . The Hague . . . Montreal
Caracas . . Bombay

THE J. G. WHITE ENGINEERING CORPORATION

Design • Construction • Reports • Appraisals

80 Broad Street, New York 4

Advertising in This Issue

Advertising Council, Inc. 173
Air Preheater Corp., The 26
Allis-Chalmers Mfg. Co. ..... 2nd Cover 23, 24, 133, 134, 135, 136
Aluminum Co. of America 117
American Creosoting Co. 121
American Telephone & Telegraph Co. 159
Anaconda Wire & Cable Co. 59

Baldwin-Lima-Hamilton Corp., Eddystone Div. 125
Bartlett Tree Experts 30
Bethlehem Steel Co. 54
Blackburn Corp., Jasper 33
Bodendieck Tool Co. 150
Brown Co. 108
Buffalo Forge Co. 14

Chance Co., A. B. 148
Chase Brass & Copper Co. 36
Chase & Sons, Inc. 167
Clark Controller Co. 161
Cole Electric Co. 176
Cope Inc., T. J. 142
Copperweld Steel Co. 29

Directory of Engineers 174
Dossert Mfg. Corp. 8
du Pont de Nemours & Co., (Inc.) Elastomers Div. 131

Electrical Engineers Equipment Co. 169
Electroline Company 5
Elliott Company 127
Engineers, Directory of 174
Everstick Anchor Co. 137

Federal Pacific Electric Co. 3rd Cover
Ferranti Ltd. 143
Fisher-Pierce Co., Inc. 40
Foster Wheeler Corp. 34, 35
Foushee & Heckendorn 152

General Cable Corp. 129
General Electric Co., Apparatus Dept. 94, 95, 96, 97 100, 101, 151
Electronics Dept. 32
Globe Co., The 138
Greenlee Tool Co. 120
Guaranty Trust Co. of N. Y. 171

Hazard Insulated Wire Works 4
Hubbard & Company 146, 147
Husky Products, Inc. 122

I-T-E Circuit Breaker Co., Switchgear Div. 9
Indiana Steel & Wire Co., Inc. 157

Johns-Manville 175

Kearney Corp., James R. 12, 13
Keasbey & Mattison Co. 46
Kellogg Co., The M. W. 31
Kimble Glass Co., Sub. Owens-Illinois 56
Kuhlman Electric Co. ..... 4th Cover

Lapp Insulator Co., Inc. 38, 39
Leeds & Northrup Co. 139
Line Material Co. 49, 50, 51, 52, 53

Malleable Iron Fittings Co. 149
Mallory & Co., Inc., P. R. 45
McGraw-Hill Book Co., Inc. 157
Minneapolis-Honeywell Regulator Co., Heating Controls Div. 119
Minerallac Electric Co. 153
Moloney Electric Co. 60

O. Z. Electrical Mfg. Co., Inc. 163
Ohio Brass Co. 106, 107
Okonite Co., The 4
Orangeburg Mfg. Co., Inc. 155
Overton Co., S. E. 153

PLM Products, Inc. 150
Pacific Coast Engineering Co. 105
Pacific Pumps, Inc. 55
Page Fence Ass'n. 152
Page Steel & Wire Div., American Chain & Cable 151
Pennsylvania Transformer Co. 16, 17
Preformed Line Products Co. 47
Premax Products Div., Chisholm-Ryder Co., Inc. 152

RT&E Corp. 104
Reliable Electric Co. 58
Revere Copper & Brass, Inc. 103
Reynolds Metals Co. 145
Riley Stoker Corp. 10, 11
Roebling's Sons Corp., John A. 123
Royal Electric Mfg. Co., Inc. 144
Ryerson & Son Inc., Joseph T. 153

S&C Electric Co. 18
Sangamo Electric Co. 27
Searchlight Section 164, 165
Shaw-Perkins 153
Simplex Wire & Cable Co. 7
Smith & Sons Inc., Seymour 156
Socony Mobil Oil Co., Inc. 15
Southern States Equipment Corp. 6
Standard Oil Co. (Indiana) 37
Standard Transformer Co. 28

Tickle Engineering Works, Inc., Arthur 148
Triangle Conduit & Cable Co., Inc. 140, 141

United States Rubber Co. 25

Westinghouse Electric Co. 41, 42 43, 44, 109, 110, 111, 112 113, 114, 115, 116
Wheeler Reflector Co. 57
Willys Motors, Inc. 48

■

PROFESSIONAL SERVICES 174

■

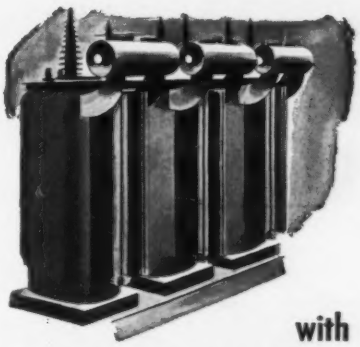
CLASSIFIED ADVERTISING

F. J. Eberle, Business Mgr.

EMPLOYMENT OPPORTUNITIES. 164, 165

EQUIPMENT (Used or Surplus New) For Sale 165

Seal oil IN! Seal moisture OUT!



with

J-M TRANOLSEAL

developed especially for efficient sealing against

refined oils

You can stop the dangerous and costly leakage of oil from transformers and switchgear with Johns-Manville's Tranolseal sealing compound. This permanently plastic material has a nondrying vegetable oil base. It provides effective sealing action against air (dust and moisture), inert gas, water, 13% NaCl brine as well as medium to high viscosity refined oils. Thus you can also prevent penetration by moisture and other ambient sources of trouble.

Tranolseal has excellent adhesive qualities and will not corrode or deteriorate metals, rubber or plastics. It shows good resistance to weather and aging (both painted and natural) and won't stain. Furnished in 1" diameter beads. For further information write Johns-Manville, Box 60, New York 16, N. Y. In Canada, Port Credit (Toronto), Ontario.

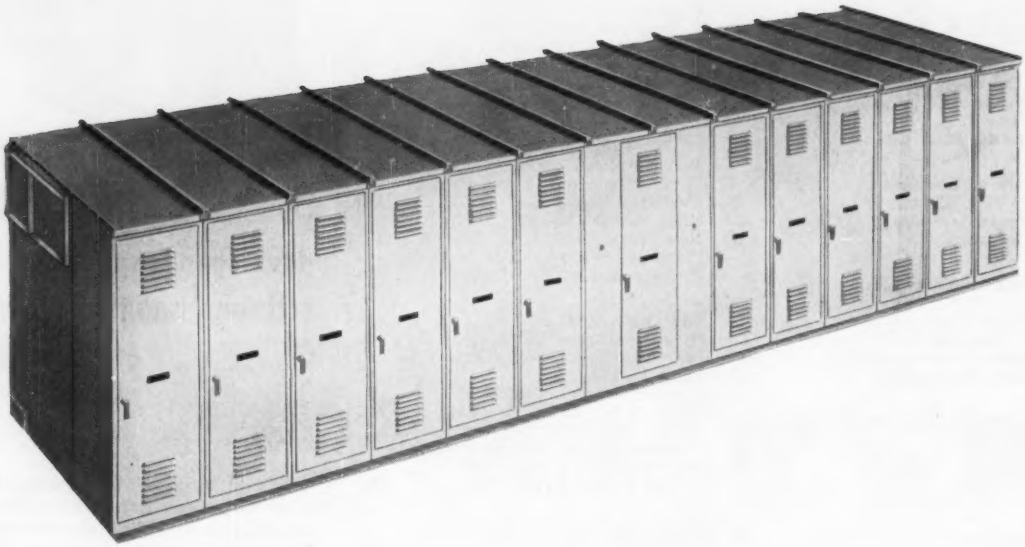
JM

Johns-Manville

SEALING COMPOUNDS

Cole Electric Co.

8439 STELLER DRIVE • TEXAS 0-4701 • CULVER CITY CALIFORNIA



4000 VOLT METAL CLAD SWITCHING EQUIPMENT (OUTDOOR)

CONSISTING OF: 7— 600 Ampere Regulated Line Positions

2—1200 Ampere Bank Positions

1— 600 Ampere Capacitor Position

1—1200 Ampere Bus Tie Position

2— 600 Ampere Street Light Positions

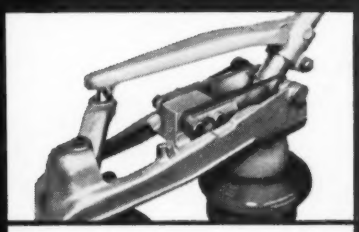
vertical-break versatility

FPE
FEDERAL PACIFIC ELECTRIC

announcing the new

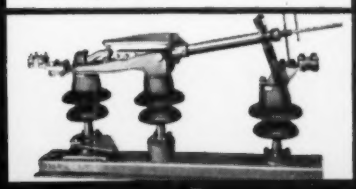
FEDERAL PACIFIC ELECTRIC

TG-O AIR SWITCH



Single-Link Simplicity—Only one moving link connects the arm at the top of the rotating insulator with the blade assembly—the simplest and most efficient enter-turn type mechanism.

Single-Pole Switch Unit—In the closed position.



The new TG-O Vertical-Break Air Switch is designed so that it may be stocked by utilities for immediate field installation over a wide range of conditions.

The new TG-O has proven to be outstandingly efficient under the most severe icing conditions. The large force leverage near the end positions and the shape of the parts at the hinge and clip ends assures progressive shattering of ice without cantilever stress on the insulators.

The versatile TG-O is available in sizes 7.2, 14.4 and 23-kv; 400, 600 and 1200 amp continuous; 20,000, 40,000 and 61,000 amp momentary ratings; A.S.A. and N.E.M.A. standards. Write for Catalog No. 4-126 for full details from the Pacific Electric Switchgear Division, 5815 Third Street, San Francisco 24, Calif.

Finest Products Engineered

FEDERAL PACIFIC ELECTRIC

COMPANY

50 Paris Street, Newark 1, N. J.
Division, 5815 Third St., San Francisco 24, California.

To Serve Better – Electrically

KUHLMAN, ORIGINATOR OF "Quick Grip," INTRODUCES A

New High Voltage Bushing*

FOR RATINGS ABOVE 5000 VOLTS

Now, KUHLMAN affords new safety, new convenience and new speed in handling high voltage connections on cover bushings of pole type transformers.

In 1939, KUHLMAN introduced the first "Quick Grip" Bushing for 5000 volts and below. The principle of this bushing has, since then, been adopted by most of the country's leading transformer manufacturers. Linemen all over the world prefer KUHLMAN "Quick Grip" Bushings . . . no tools are necessary . . . no live parts are exposed . . . connections are simple, safe and fast. Check all these advantages:

Easy Installation –the line lead is simply inserted into the hole in either side of the bushing . . . a twist of the knob completes the job!

Complete Protection –the protective knob reduces effects of weather, corrosion and the possibility of animals and birds disrupting service.

Versatile Application –new cover type "Quick Grip" will soon be available on all pole type distribution transformers. Accommodates full range of EEI-NEMA wire sizes.

Your KUHLMAN representative will be happy to explain this high voltage "Quick Grip" Bushing . . . it is another KUHLMAN feature that has provided new standards of distribution transformer service and long life for America's leading utilities.

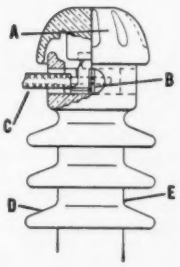
A—Hard rubber cap protects — simple clockwise rotation clamps lead firmly.

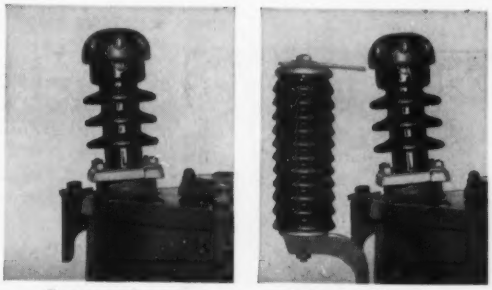
B—Gap Electrode

C—Line leads . . . can be entered from two sides.

D—Porcelain.

E—Corrugations provide ample creepage distance.





Conventional or CSP Application

*PATENT PENDING

KUHLMAN ELECTRIC COMPANY

BAY CITY, MICHIGAN • CRYSTAL SPRINGS, MISSISSIPPI • SALINAS, CALIFORNIA